

Chapter 2. Alternatives

2.A. Introduction

This chapter describes the development, formulation, and structure of alternatives analyzed in detail for the proposed S-CNF Noxious Weed Management Program. It also describes alternatives that were considered but eliminated from detailed analysis and the reasons for their elimination. The alternatives development discussion summarizes the public involvement process, issues, and concerns identified by the public during project scoping, and the evaluation of those issues in the development of alternatives. Components of the Forest Service's IWM Program that were used to formulate the various alternatives analyzed in detail are described. Examples of IWM components include weed treatment and non-treatment practices, treatment objectives and priorities, site restoration and monitoring, an adaptive weed management strategy, and a minimum tool approach. Alternatives analyzed in detail and their structure, including mitigation measures where appropriate, are described. They include a Proposed Action, two action alternatives, and a No Action Alternative (No Change from Current Management). Map 2-1 (back of Chapter 2) shows the S-CNF boundary and Ranger Districts, excluding the FCRONRW.

2.B. Alternatives Development Process

2.B.1. Preliminary Range of Alternatives

A preliminary range of six alternatives conceptually covering various combinations of possible noxious weed management strategies was initially identified by the Weed EIS Analysis Content Team for consideration. The alternatives included four action alternatives, a No Action Alternative, and a No Treatment Alternative. NEPA regulations require analysis of a No Action Alternative in an EIS even though it may not meet project purpose and need. The No Action Alternative provides a basis for evaluating and comparing the environmental effects, both beneficial and adverse, of the other alternatives. Whether any of the six preliminary alternatives (and any other alternatives identified thereafter) would receive detailed analysis in the Draft EIS and in this Final EIS depended on comments subsequently received from the public during scoping, and a determination of how well (or whether) the alternatives would meet project purpose and need.

The six preliminary alternatives presented at the public scoping meetings included the following:

- Alternative A – No Action Alternative (No Change from Current Management)
- Alternative B – Aerial and Ground-Based Herbicide Applications Plus Mechanical, Vegetative, Controlled Grazing, Biological, and Combinations of Treatments

- Alternative C—Ground-Based Herbicide Application Plus Mechanical, Vegetative, Controlled Grazing, Biological, and Combinations of Treatments (No Aerial Herbicide Application)
- Alternative D—Mechanical, Vegetative, Controlled Grazing, Biological, and Combinations of Treatments (No Herbicide Application)
- Alternative E—Mechanical, Vegetative, Controlled Grazing, Biological, and Combinations of Treatments Followed by Herbicide Application if These Treatments are Unsuccessful
- Alternative F—No Treatment Alternative (Discontinue Current Weed Management Program)

2.B.2. Public Involvement

Public involvement formally began with the publication of a NOI to prepare a Draft EIS for a proposed noxious weed management program on the S-CNF, excluding areas within the FCRONRW. The NOI was published in the Federal Register (Vol. 66, No. 24, pp. 64799-64800) on December 14, 2001. It provided information on the background (needs) and purposes of the proposed project, announced and provided information on public scoping meetings, and requested public comments on the proposed project. During the week of December 14, the proposed project also was described in the S-CNF quarterly report of the Schedule of Proposed Actions (SOPA) and was displayed on the S-CNF website, <http://www.fs.fed.us/r4/sc>, under “current projects.”

A project scoping letter was mailed to 502 individuals, interest groups, local governments, and other agencies on December 18, 2001. This mailing list was compiled from the S-CNF’s SOPA list, scoping mailing lists from previous S-CNF projects, and various lists of permit holders from both the S-CNF and the BLM. The scoping letter included a self-addressed comment card to be returned to the S-CNF, with or without specific comments, in order to be maintained on the project mailing list. The Shoshone-Bannock Tribes were sent a government-to-government letter on January 15, 2002, describing the project and requesting input.

Three public scoping meetings were held in the three local communities surrounding the project area in early January 2002. The first scoping meeting was in Arco, Idaho, on January 8, the second in Challis, Idaho, on January 9, and the third in Salmon, Idaho, on January 10. Notices of the public meetings appeared in the three local newspapers (Arco Advertiser, Challis Messenger, and Salmon’s Recorder Herald) during the week of December 24, 2001. Notices of the public meetings also were announced over the local radio stations in Salmon and Challis the week of January 1, 2002. The meetings were only lightly attended by the public, including three individuals in Arco, six in Challis, and one in Salmon. Most of the attendees provided written comments either during the meeting on the comment form provided or by mail (and/or e-mail) at a later date. Notes describing issues and concerns raised by the public were recorded at each meeting and a sign-in list was distributed. Additional information on the public involvement process for the proposed project is provided in *Chapter 5, Consultation and Coordination*.

2.B.3. Public Responses and Concerns

A total of 25 individuals or organizations responded with 88 written comments on the proposed project as a result of public scoping. The S-CNF Weed EIS Content Analysis Team reviewed and placed each comment into one of several categories based on subject matter, context, content, and intent. Of the 88 written comments received, 18 were considered “statements” that reflected an interest, idea, suggestion, or feeling that did not lead to an issue. The remaining 70 comments were construed as concerns, some of which contained underlying “issues” that led to points of discussion, debate, or dispute. These were categorized into the following eight groupings:

- 24 comments were on a variety of subjects that had been previously incorporated into the framework of this EIS;
- 15 comments fit one or more of the criteria on non-significance (six being outside the scope of this EIS, eight being already decided by law, regulation, policy, or Forest Plan, and one being conjectural without scientific support);
- Eight comments reinforced a variety of subject matter that must receive adequate consideration in the EIS, focusing on analysis, mitigation, and disclosure of potential impacts;
- Seven comments supported several of the preliminary draft alternatives presented at the public scoping meetings, as follows:
 - Six comments supported Alternative B—Aerial and Ground-based Herbicide Applications Plus Mechanical, Vegetative, Controlled Grazing, Biological, and Combinations of Treatments.
 - One comment supported Alternative E—Mechanical, Vegetative, Controlled Grazing, Biological, and Combinations of Treatments Followed by Herbicide Applications if These Treatments are Unsuccessful.
- Seven comments wanted the EIS to include provisions to allow flexibility to include new chemicals, new treatment areas, and new target plant species;
- Six comments supported an additional alternative that focused on a proactive prevention approach to weed management, taking action on numerous human uses known to cause site disturbance, spread seeds, and exacerbate weed expansion (roads, logging, grazing, mining, off-highway vehicles [OHVs]);
- Two comments opposed Alternative F—No Treatment (Discontinue Current Weed Management Program);
- One comment opposed livestock grazing as a treatment.

The Weed EIS Content Analysis Team concluded that three of the above groupings of scoping comments needed to be reviewed for further consideration and follow-up action. These are:

1. Include provisions in the EIS for flexibility in including additional chemicals, new treatment sites, and new target species (seven comments).

2. Further review and follow-up on the specified subject matter (e.g., analysis, mitigation, and disclosure) to ensure the EIS provides appropriate inclusion and consideration (eight comments).
3. Consideration of an additional alternative (a “Proactive Prevention Alternative”), whether it has merit, is within the scope of this EIS, and has legal and policy standing, and, if not, provide rationale for its dismissal as an alternative considered but eliminated from detailed analysis (six comments).

The written comments also were grouped into eight topics that either related to potential issues, stated a preference for specific alternatives, or expressed a desired direction or content for specific alternatives. Twenty-two of the 25 responders included comments relating to one or more of the following eight topics. These eight topics are summarized below along with the number (x) and percent of the 22 responders who commented:

1. Opposed to any road or trail closure: (5), 22.7 percent
2. Request provisions in EIS for flexibility in chemical use, acres treated, and sites treated: (4), 18.2 percent
3. Favor Alternative B (full use of all weed control strategies): (4), 18.2 percent
4. Request consideration of new alternative (“Proactive Prevention Alternative”) focusing on eliminating human-caused weed spread and establishment activities: (3), 13.6 percent
5. Favor road closures (not related to proponents of the “Proactive Prevention Alternative”): (2), 9.1 percent
6. Opposed to Alternative F (No Treatment Alternative): (2), 9.1 percent
7. Favor Alternative E (no chemical use except as a last resort): (1), 4.5 percent
8. Opposed to livestock grazing as a weed treatment action: (1), 4.5 percent

2.B.4. Issues

Based on comments received from the public during and following scoping meetings (see *Section 2.B.3, Public Responses and Concerns*), there appears to be little opposition regarding the use of chemicals or livestock as weed treatment options on the S-CNF. In addition, it appears there is support for using the full array of weed treatment options and the need to include provisions for chemical use, acreage, and treatment site flexibility on the S-CNF.

Although there is acceptance to the use of chemicals in the treatment of noxious weeds, there is still a concern over the environmental and health risks herbicides pose. However, in general, the public recognizes that noxious weeds pose a greater threat to the physical, biological, and ecological environment of the S-CNF. These environmental and health concerns led to the development of six key issues listed below that are fully addressed in each of the four alternatives analyzed in detail.

1. Potential effects on wildlife habitat, fisheries, native plant communities, threatened/endangered/sensitive (TES) species, vegetation diversity, and ecosystem function because of noxious weeds.

2. Potential effects on wildlife species and their habitat from ground and aerial applications of herbicides.
3. Potential effects on fisheries and aquatic habitat from ground and aerial applications of herbicides.
4. Potential effects on TES terrestrial and aquatic species from ground and aerial applications of herbicides.
5. Potential effects on TES plant species from ground and aerial applications of herbicides.
6. Potential effects on human health from ground and aerial applications of herbicides.

There also seems to be reasonable support from the public (13.6 percent of those who responded) for the need to address human-caused activities or uses that lead to or exacerbate weed expansion, encroachment, and establishment, namely, livestock grazing, logging, roads, mining, and recreation (OHVs). These concerns led to an additional issue:

7. Human uses exacerbate the spread and establishment of noxious and invasive non-native weeds. Without a proactive prevention strategy that limits, modifies, or curtails current human uses on the S-CNF, any type of physical treatment will not be successful in controlling weeds.

This issue led to the development and consideration of an additional alternative – the Proactive Prevention Alternative – that alters the original intent and scope of weed treatment activities and focuses on taking action on numerous human use activities as a means to actively prevent the establishment and spread of weeds, while at the same time incorporating the full range of weed treatment activities where absolutely necessary.

The public comments did not lead to any additional key issues not already identified nor any non-key issues requiring further discussion.

2.B.5. Development of Alternatives

Alternatives were developed based on an understanding of project purpose and need, issues identified by the public during and following scoping meetings, and Council on Environmental Quality (CEQ) regulations for implementing the provisions of NEPA. CEQ regulations (CEQ 1978, 1983) provide important guidelines on developing and evaluating alternatives in regard to meeting project purpose and need. These regulations require that federal agencies rigorously explore and evaluate all “reasonable” alternatives. CEQ regulations also stress that agencies not disregard the “common sense realities” of a given situation in developing alternatives. In addition, when considering the range of viable alternatives, agencies should seek a reasonable range of practical and feasible alternatives that will accomplish project objectives. Action alternatives that fail to meet project purpose and need do not need to be analyzed in detail in an EIS (CEQ 1978, 1983).

Based on CEQ regulations and guidelines, the defined project purpose and need, the preliminary range of alternatives presented to the public, and scoping comments received from the public, a final set of alternatives was developed and include:

- No Action Alternative (No Change from Current Management)

- Proposed Action—Aerial and Ground-Based Herbicide Applications Plus Mechanical, Biological, Controlled Grazing, and Combinations of Treatments
- Alternative 1—Ground-Based Herbicide Application Plus Mechanical, Biological, Controlled Grazing, and Combinations of Treatments (No Aerial Herbicide Application)
- Alternative 2—Mechanical, Biological, Controlled Grazing, and Combinations of Treatments (No Herbicide Application)

These alternatives are described in detail in *Section 2.D, Alternatives Analyzed in Detail*, of this chapter. Alternatives considered but eliminated from detailed analysis include: the No Treatment Alternative (Discontinue Current Weed Management Program); the Mechanical, Vegetative, Controlled Grazing, Biological, and Combinations of Treatments Followed by Herbicide Applications if These Treatments are Unsuccessful Alternative; and the Proactive Prevention Alternative, which are described in detail in *Section 2.E, Alternatives Considered but Eliminated from Detailed Analysis*, of this chapter.

2.C. Integrated Weed Management

All of the alternatives analyzed in detail are based on an IWM approach. As noted in Chapter 1, *Purpose and Need*, this approach is part of a larger IPM approach (as defined in Forest Service Handbook 3409) that the S-CNF follows in managing various pests, including noxious and invasive non-native weeds. IPM practices are based on the principle that a single management approach will not be successful, but that implementing a fully integrated approach to weed management significantly improves the chances of a successful program.

A variety of methods and activities can be carried out under an IWM program that provides a full range of weed management strategies. These are described in the following text and include various weed treatment practices; weed treatment objectives, priorities, and criteria; restoration and monitoring programs; an adaptive strategy for future weed management; and a “minimum tool” weed treatment concept. Specific management tools that would be selected from these methods and activities and implemented under each of the alternatives analyzed in detail are described in *Section 2.D, Alternatives Analyzed in Detail*, in this chapter. Other components equally important in an IWP program, including non-treatment practices such as weed prevention, education, and coordination measures as well as mitigation measures and BMPs, also are described in *Section 2.D, Alternatives Analyzed in Detail*, of this chapter for each alternative analyzed in detail.

2.C.1. Treatment Practices

Treatment practices available for use in eradicating, controlling, and/or containing noxious, invasive, and non-native weeds include mechanical, biological, controlled grazing, chemical (aerial and ground-based), and combinations of these treatments. Cultural treatment is discussed further below as a part of site restoration techniques. Selection of the most appropriate treatment practice depends on numerous factors, including the risk of weed expansion, weed species biology, time of year, environmental setting, soil type, and management objective. The anticipated types, mix, and extent of treatment practices and the

management objective associated with each alternative are presented in *Section 2.D, Alternatives Analyzed in Detail*.

Treatment practices described in the following text could potentially be used on the S-CNF and would be considered on a site- and weed-species-specific basis. Treatment descriptions are based on recent NEPA documents covering noxious weed management programs on nearby National Forests. These documents cover the former Salmon National Forest (U.S. Forest Service 1987b) and Challis National Forest (U.S. Forest Service 1989) (now the Salmon-Challis National Forest, Idaho); FCRONRW, Idaho (U.S. Forest Service 1999a); Flathead National Forest, Montana (U.S. Forest Service 2000a); Sandpoint Ranger District, Idaho (U.S. Forest Service 2001d); Beaverhead-Deerlodge National Forest, Montana (U.S. Forest Service 2001a); and Lolo National Forest, Montana (U.S. Forest Service 2001c).

a. Mechanical Treatment

Mechanical treatment consists of methods that physically destroy, disrupt growth, or interfere with the reproduction of noxious and invasive non-native weeds. These methods can be accomplished by hand, hand tool, or power tool and may include pulling, grubbing, digging, hoeing, tilling, cutting, mowing, and mulching weeds. Mechanical treatment also could include burning weeds with a propane torch. Mechanical treatments would typically be used on a limited basis, primarily to control individual plants or very small, isolated infestations of weeds. Larger infestations of weeds are very difficult to control with mechanical treatment. Furthermore, steep slopes and rocky soils prohibit or limit the use of many mechanical treatment activities.

Hand pulling and grubbing of weeds is the oldest form of weed treatment, but it is very labor intensive, relatively ineffective in treating large infestations of perennial weeds, and often leaves root fragments in the ground. If sufficient root mass is removed, the individual plant can be destroyed. However, some weed species such as leafy spurge respond to mechanical treatment by aggressively resprouting, even if small root fragments are left in the soil. This type of treatment is much less effective on rhizomatous than non-rhizomatous weed species because of their well-developed root system and carbohydrate reserves.

Cutting and mowing plants can reduce reproduction in perennial species and weaken their competitive advantage by using up carbohydrates stored in the root systems. Mechanical treatments must be repeated several times a year for many years to eradicate weed species that are prolific seed producers and have built up a residual seed bank in the soil. To be most effective, mechanical treatment must occur before seed production occurs. Plants that have already flowered must be removed from the treatment area and destroyed. For the above reasons, mechanical treatments are difficult or impossible to implement and achieve success on large weed infestations, rhizomatous invasive weeds, and steep and/or remote terrain.

Studies on the Lolo National Forest in western Montana (U.S. Forest Service 2001c) provide valuable information on the effectiveness, effort, and cost associated with several mechanical treatments of spotted knapweed, by far the dominant weed species on the S-CNF. The effects of mowing and pulling were analyzed on test plots established on two spotted knapweed stands with 76 percent cover and 53 percent cover. Mowing spotted knapweed once during the early bud stage and again during the late bud stage provided

99 percent flower control but 0 percent plant reduction. Pulling spotted knapweed provided 100 percent flower control, 56 percent plant control, and increased the proportion of bare ground from approximately 3 percent to 14 percent. Annual costs were \$200 per acre for mowing knapweed and \$8,372 per acre for pulling knapweed. Extrapolating study results of pulling knapweed to a larger area, the analysis estimated that a 1,000-acre area heavily infested with spotted knapweed would contain approximately 170 million adult plants. It was also estimated that because spotted knapweed has extensive seed banks, the 1,000-acre area would have the potential to produce 600 billion new plants over a 10-year period. Based on these estimates, it was calculated that 1,000 hand pullers would each have to harvest approximately 600 million plants for 10 years to diminish a spotted knapweed population of 170,000 adult plants per acre covering a 1,000-acre area (U.S. Forest Service 2001c).

b. Biological Treatment

This treatment consists of using biological controls (agents) such as insects and plant pathogens to attack, weaken, and kill a targeted weed species and reduce its competitive or reproductive capacity. Natural limiting factors such as predators (animals, insects), disease, and other vegetation competing for nutrients, moisture, space, and light generally prevent populations of native plants from spreading out of control. Non-native plant species have become a problem in parts of the western U.S. because of the absence of limiting factors that are present in their native habitats.

Biological controls are used to reduce densities and rates of weed spread rather than to eradicate weeds. Biological controls may decrease the production of viable weed seed and may slow the rate of weed spread, but by themselves do not completely eradicate or contain noxious weed infestations. This treatment is most effective on dense infestations of a weed species covering large areas, but it may take 10 to 20 years for some biological treatments to be effective (U.S. Forest Service 1999a). Other limitations in the use of biological controls include the following: weeds continue to spread while the biological controls are becoming established; some weed species do not have biological controls; populations of biological controls can fail (leave an area or die); and a mix of different species of biological controls is often necessary to effectively treat a given weed site.

Most experts regard the introduction of biological controls as the best long-term solution where there are large, widespread populations of a specific noxious weed species (U.S. Forest Service 2001d). Cycles of abundance for the noxious weed and biological control agent typically follow patterns associated with density-dependent relationships between predator and prey, and ideally result in equilibrium between the biological agent and the weed. This treatment is more effective when used in combination with, or prior to, other treatment methods such as herbicides.

The U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS) rigorously screens and tests new biological agents for impacts on agricultural plants and on threatened, endangered, and sensitive plant species. It then prepares environmental assessments on the possible impacts of releasing those agents (U.S. Forest Service 1999a). Before the prospective biological controls can be released, they are placed in quarantine under “eat or starve” conditions with a variety of plant species to determine if they are host-specific to the plants they are intended to control. Insects are generally the most popular and

available biological agents. Only APHIS-approved biological controls would be used on the S-CNF and would be released according to APHIS requirements or Forest Service policy, whichever is more restrictive.

Examples of biological controls that could potentially be used on the S-CNF include the following: for spotted knapweed – seed gall fly (*Urophora affinis*), root moth (*Agapeta zoegana*), flower weevil (*Larinus minutus*), root boring weevil (*Cyphocleonus achates*), and seedhead moth (*Metzneria paucipunctella*); for rush skeletonweed – gall midge (*Cystiphora schmidtii*), gall mite (*Eriophyes chondrillae*), and rust (*Puccinia chondrillina*); for St. Johnswort – beetle (*Chrysolina hyperici*) and moth (*Aplocera plagiata*); and for leafy spurge – flea beetles (*Aphthona* spp.). Optimal biological management would include a combination of different biological agents that attack or stress different parts of a weed's system, such as noted for the four agents for spotted knapweed. New, APHIS-approved biological controls may be substituted for current agents if more appropriate, or if current agents are no longer available or APHIS approved.

c. Controlled Grazing Treatment

This treatment category consists of controlling localized infestations of weeds by livestock grazing. Where appropriate, livestock grazing would be integrated with other weed treatments described in this section to achieve more effective weed control. Although it can be somewhat seasonal in application, prolonged or coerced grazing by certain kinds of livestock has been used to suppress noxious weeds (Crabtree and Lake 2001). For example, sheep can be induced to eat leafy spurge, which is toxic to some livestock but not to sheep (or goats). Sheep are known to suppress leafy spurge populations, but they usually do not totally eradicate this weed and will not always graze leafy spurge to the exclusion of native grasses. Also, sheep grazing leafy spurge (and other weeds) while the seed is maturing will pick up seeds in their fleece, possibly infesting weed-free areas. Goats have been used on a limited basis in efforts to control weeds on portions of nearby lands administered by the BLM Salmon Field Office. Hay, water, or minerals can be used to attract livestock to the weed patch.

Weed control using livestock grazing would be conducted in accordance with Forest Service Grazing Regulations and Regional Policy. A site-specific project operation plan would be developed for the treatment area that would consider various factors such as target weed species, type of livestock to be used, forage preference, planned grazing intensity, herding characteristics, topography, onsite water, season of use, and a monitoring program. Forest Service regulations, policies, and the appropriate BMPs (Appendix A) would be followed and the project operation plan would be strictly adhered to during all livestock grazing weed treatment efforts.

d. Chemical Treatment

Chemical treatment is an important method when the management objective is weed eradication or control. It involves the application of herbicides (chemical compounds) at certain stages of plant growth to kill weed species. Herbicides are extensively screened and tested before they are approved and registered for use by the U.S. Environmental Protection Agency (EPA). Such registrations typically require at least 120 tests over a 7- to 10-year period and can cost approximately \$30 million to \$50 million (U.S. Forest Service 2001c).

Herbicide labels carry the force of laws governed by federal and state agencies. Labels contain information on the proper administration of each herbicide, including the following: a list of the ingredients; EPA registration number; precautionary statements (hazards to humans and domestic animals, personal protective equipment, user safety recommendations, first aid, and environmental hazards); directions for use, storage, and disposal; mixing and application rates; approved uses and inherent risks of use; limitations of remedies; and general information. The S-CNF has used the ground-based application of herbicides in its IWM program since 1989 and strictly complies with all label requirements governing herbicide use and application.

There are a variety of types of herbicides, and many have been limited in their use by the EPA or the Occupational Safety and Health Administration (OSHA). Many herbicides are “selective” and kill specific types of plants, while others are “general” and kill almost all actively growing plant species contacted. Most herbicides are not truly selective at the species level, but will selectively kill forbs or certain groups of species. Some of these herbicides are pre-emergent and absorbed through the roots while most herbicides affect the established plant through foliar and root absorption.

Herbicides that could potentially be used to control weeds on the S-CNF include those active ingredients in chemicals approved and currently being used in ground-based herbicide applications on the S-CNF (2,4-D amine, glyphosphate, picloram, and dicamba) (U.S. Forest Service 1987a; 1989) and/or other EPA-registered and approved chemicals, as appropriate, for weed control, such as Transline (active ingredient is clopyralid), Scythe (pelargonic acid), and WOW (corn meal). It is anticipated that the herbicides described in the following text would be among the primary chemicals used in those alternatives analyzed in this EIS that include the chemical treatment of weeds. All alternatives involving the use of herbicides will have the flexibility to: 1) use any chemicals appearing on the Forest Service’s list of herbicides approved for use on National Forests, and 2) use any new or updated chemicals as they are registered and approved by the EPA and added to the Forest Service’s list of herbicides approved for use and accompanied by complete risk assessments.

Selection of a herbicide for site-specific application under those alternatives would depend on its chemical effectiveness on a particular weed species, success in previous similar applications, habitat types, soil types, nearness of the weed infestation to water, and the presence or absence of sensitive plant, wildlife, and fish species. Because of environmental concerns, it is essential that all herbicide applications follow label instructions, specifications, and precautions as well as applicable Forest Service policy. In instances where herbicide label, federal, or state stipulations overlap, the more restrictive criteria would apply. Additional fact sheet information, such as characteristics and risks, on the herbicides described below and other registered chemical herbicides can be reviewed at <http://infoventures.com/e-hlth/> (Information Ventures, Inc. 2002). Characteristics and properties of herbicides are discussed further in *Chapter 4, Environmental Consequences* and Appendix J. Appendix J also lists typical and maximum label application rates for herbicides.

Types of Herbicides. The following herbicides are specifically addressed in this document.

2,4-D amine is the most commonly used, and most widely studied, herbicide in the U.S. (U.S. Forest Service 2000a). It is labeled for a wide range of uses, and is an active ingredient in many products offered by several manufacturers for home use. Several common brand names containing 2,4-D formulations are Weed-B-Gon, Weedar 64, HiDep, Formula 40, and Solution. 2,4-D acts as a growth-regulating hormone on broad leaf plants, being absorbed by leaves, stems, and roots and accumulating in a plant's growing tips. 2,4-D has very little persistence in the environment (half life of approximately 1 week), although its salts can move through sandy soils. Soil microorganisms degrade 2,4-D in a matter of weeks, which can require the annual application of this herbicide for long-term effectiveness. 2,4-D has low toxicity to aquatic organisms, with several formulations approved for use in water and near water (U.S. Forest Service 2001c). WEEDAR 64, for example, is a 2,4-D product that is registered for use near water. By comparison, 2,4-D is less persistent in the environment than picloram and can be used closer to water than picloram. 2,4-D exhibits good control of knapweed at application rates of 1 to 2 pounds per acre with repeat applications, and moderate control of houndstongue, sulfur cinquefoil, Canada thistle, and St. Johnswort (U.S. Forest Service 2001d). 2,4-D has been implicated in a class of synthetic chemicals called endocrine disrupting compounds (EDC). The EPA has identified 2,4-D for continuing study, but notes that the connection between 2,4-D and endocrine disruption in wildlife and humans is uncertain (U. S. EPA 1997). The herbicide continues to be recommended for use. The impact of EDCs on wildlife and humans is discussed in Chapter 4.

Chlorsulfuron is used to control many broadleaf weeds and some annual grass weeds. It is absorbed by the leaves and roots of the weed and prevents production of an essential amino acid, which inhibits cell division and plant growth. Treatment areas include non-crop sites such as roadsides, rights-of-way (ROWS), and fence rows. A common formulation of this herbicide is the marketed product, Telar. Chlorsulfuron has a half life of 1 to 3 months, and is broken down to smaller compounds by soil microorganisms. Contact of this herbicide with non-target plants may injure or kill plants. However, it is practically nontoxic to most fish, aquatic invertebrates, birds, and mammals because of the very low use rates and dispersion of residues to deeper soil layers with leaching (Information Ventures, Inc. 2002).

Clopyralid is a relatively new and very selective herbicide. It is toxic to some members of only three plant families: the composites (Compositae), the legumes (Fabaceae), and the buckwheats (Polygonaceae). Clopyralid is practically non-toxic to birds and animals, and exhibits low toxicity in aquatic animals (DOW 2003). Clopyralid is marketed under a number of trade names. It is the active ingredient in Transline and one of two active ingredients (the other being 2,4-D) in Curtail. Clopyralid is very effective against knapweeds, hawkweeds, and Canada thistle at application rates of one-quarter to one-half pound per acre (U.S. Forest Service 2001d). Its selectivity makes it an attractive alternative herbicide on sites with non-target species that are sensitive to other herbicides. Clopyralid is more persistent than 2,4-D and dicamba, but less persistent than picloram. It is degraded almost entirely by microbes and is not susceptible to photo or chemical degradation (Tu et al. 2003). Clopyralid does not bind strongly with soil particles. This lack of adsorption means that it can possibly leach into surface and groundwater. Although no extensive off-site movement has been reported, the possibility of groundwater effects must be considered (Tu et al. 2003). Inert ingredients include isopropyl alcohol and polyglycol (Dow 2003).

Adjuvants are recommended as well, although information about the synergistic effects of adjuvants is extremely limited.

Dicamba is the active ingredient in the marketed product Banvel (liquid formulation) and Veteran 10G (bead formulation). Inert ingredients have not been disclosed (MicroFlo 1999). It is a broadleaf herbicide that is readily absorbed by leaves and roots and is concentrated in the metabolically active parts of the plants. Dicamba is effective against a similar range of weed species applied at similar rates as 2,4-D. However, dicamba is somewhat more persistent in the environment than 2,4-D and, therefore, provides somewhat longer control of susceptible weed species. Dicamba is slightly toxic to fish and amphibians and is practically non-toxic to aquatic invertebrates. Dicamba does not accumulate or build up in aquatic animals. Dicamba is moderately persistent in soils and slightly soluble in water (U.S. Forest Service 1995b). Despite its low toxicity, dicamba is not recommended for direct application to water (MicroFlo 2003).

Fosamine is intended for use on trees and bushes and acts by inhibiting cell division. It has an average half life of 8 days, is moderately mobile in soil, and is stable in water. The primary degradation mechanism is by soil microorganisms. It is slightly toxic to some species of mammals and birds and has a low toxicity to some species of fish. A common formulation of this herbicide is the marketed product, Krenite. This compound will not be used until a risk assessment has been completed and Fosamine is included on the Forest Service list of approved chemicals.

Glyphosate is labeled for a wide variety of uses, including home use, and is marketed as Rodeo, Accord, and Roundup. (Rodeo is proposed as the main glyphosate compound for use on the S-CNF, mainly for its low toxicity to aquatic systems). Glyphosate is a non-selective, broad-spectrum herbicide that is readily absorbed by leaves, translocated throughout the plant, and disrupts the photosynthetic process. This herbicide affects a wide variety of plants, including grasses and many broadleaves, and has the potential to eliminate desirable as well as undesirable vegetation. Some plant selectivity can be achieved by using a wick applicator to directly apply glyphosate to the target plant, thereby avoiding desirable vegetation. Glyphosate exhibits slight soil movement, and its absorption by roots is minimal to non-existent. Glyphosate readily binds to organic matter in soil and is easily broken down by microorganisms. This herbicide is especially appropriate for use where low soil mobility and short-term persistence are required to alleviate environmental concerns. The Rodeo and Accord formulations of this herbicide (without the surfactant in Roundup) are labeled for use adjacent to water (U.S. Forest Service 1999a; 2001d). Applied at the label direction rates, glyphosate would not adversely affect fish, aquatic macrophytes, or aquatic invertebrates. Inert ingredients for the Rodeo formulation have not been disclosed (DOW 2000). However, none of the adjuvants proposed for use on the S-CNF will have increased toxic effects when combined with Rodeo. There is no evidence that glyphosate is carcinogenic to humans.

Imazapic is a selective herbicide that would potentially be used in a limited number of situations. It can be applied during the fall at a rate of 8 to 12 ounces per acre to control leafy spurge and cheatgrass. Imazapic's half life is 7 to 150 days, depending on soil type and climate conditions (U.S. Forest Service 2001c). Imazapic is marketed under various labels such as Plateau.

Metsulfuron methyl is used to control annual and perennial broadleaf weeds. Typical control areas include ROWs along roadsides and powerline corridors. The most commonly used formulation of this herbicide is the marketed product, Escort. Metsulfuron methyl can be mixed with other chemicals to provide more effective weed control. This herbicide is broken down in the soil by the action of microorganisms and by the chemical action of water.

Picloram is a restricted use pesticide (can only be used by certified applicators) labeled for non-cropland forestry, rangeland, ROWs, and roadside weed control. It is the active ingredient in the marketed product Tordon. Picloram acts as a growth regulator and is used to control a variety of broadleaf weed species. It is absorbed through leaves and root uptake, is easily translocated through plants, and accumulates in new growth causing leaves to cup and curl. Picloram is generally applied at rates of one-quarter to one-half pound per acre for non-rhizomatous weeds (U.S. Forest Service 2001d). Picloram is water soluble, mobile in sandy soils low in organic matter, and may affect desirable plants that have roots growing in treated areas. Degradation by soil microorganisms is slow, and primary breakdown is by ultraviolet light. Picloram is relatively persistent (effectively controlling many weed species up to 3 years after application), although its persistence varies with soil type and weather. Picloram's mobility and persistence have generated concerns over possible groundwater contamination or runoff to surface water. Because of this concern, no more than one application of picloram in a treatment area will occur in a year. In addition, picloram is unsuitable for use on areas with shallow water tables and is restricted from use near surface water or groundwater (U.S. Forest Service 1999a). Although picloram is currently being scrutinized as an EDC, no adverse effects on endocrine activity have resulted from numerous studies conducted on mammals and birds to determine picloram toxicity values. The evidence indicates that the endocrine system in birds and mammals is not affected by exposure to picloram at expected environmental concentrations (DOW 2001).

Scythe is a non-selective, broad spectrum, foliar contact herbicide. Pelargonic acid is the active ingredient. This acid is a naturally occurring fatty acid that removes or "burns" the waxy cuticle of both annual and perennial broadleaf and grassy weeds. Scythe will only control actively growing, emerged vegetation and will "burn" only those plants coated with the spray solution. The longevity of control is less when the plants are inactive or mature. Scythe does not translocate or have residual activity in the soil, and it does not persist in the environment. This herbicide would be appropriate for use on infestations under desirable trees and shrubs. Precautions include avoiding open water, applicator safety, and impacts on actively growing, non-target vegetation (U.S. Forest Service 1999a). This compound will not be used until a risk assessment has been completed and Scythe is included on the Forest Service list of approved chemicals.

Sulfometuron methyl is used to control annual and perennial grasses and broadleaf weeds. It is absorbed by the leaves and roots of the weed and stops plant growth by inhibiting cell division. It is an effective pre-emergent herbicide due to its active root absorption. Typical treatment areas include non-croplands such as ROWs, fence rows, and along roadsides. A common formulation of this herbicide is the marketed product, Oust. Sulfometuron methyl has a half life of 1 to 3 days in bright light and approximately 1 month in soil. It is practically insoluble in water and should not be applied to any body of water or wetlands. In Oust,

sulfometuron methyl is formulated as dispersible granules that are easily suspended in water for application (Information Ventures, Inc. 2002).

Triclopyr is a selective herbicide used in various situations, such as controlling weeds or vegetation in road, powerline, railroad, and pipeline ROWs. It is the active ingredient in Garlon 4, and is effective in controlling brush when used in combination with foliar, basal bark, and cut-stump treatments. Triclopyr is often mixed with other chemicals at varying rates to improve effectiveness and reduce the amount of herbicide applied. Triclopyr degrades rapidly in soil and water (U.S. Forest Service 2001d).

WOW (With Out Weeds) is a pre-emergent, non-selective product for use in controlling various grasses and broadleaves in a garden setting. Its active ingredient is corn meal. WOW controls plants at the time of germination; weeds that have germinated will not be killed. WOW is a non-hazardous, organic material intended for use as a pre-emergent garden product. Its possible applications on the S-CNF are probably limited to very localized infestations of weeds near desirable trees or shrubs or within campsites following the treatment of mature plants by other control methods (U.S. Forest Service 1999a). This compound will not be used until a risk assessment has been completed and WOW is included on the Forest Service list of approved chemicals.

Combinations of herbicides may be the most appropriate treatment where several species of noxious weeds occur together, or where the herbicides affect weeds differently. For example, a mixture of picloram and 2,4-D, which are both broadleaf-selective herbicides, is used for many broadleaf weed species. 2,4-D generally has a shorter half-life compared to the more persistent picloram, and when used with picloram may provide more effective weed control than either chemical used alone. By itself, picloram is generally the most persistent of the herbicides described above and therefore requires fewer repeat applications, is more effective against many weed species, and when applied according to label specifications is not likely to affect non-target plants. By comparison, glyphosate (via wick application only) or 2,4-D labeled for use near water might be the only or most appropriate chemicals allowed in the treatment of common tansy, which occurs largely in moist habitats or near water. In contrast, picloram may be used more often to treat yellow starthistle, which occurs in dry sites. Chemical treatment also can be used in conjunction with, or preceding, non-chemical weed control treatments, depending on weed species composition, infestation level, and environmental setting.

Inert Ingredients and Adjuvants. Herbicide manufacturers add inert ingredients (or “other ingredients”) to enhance the action of the active ingredient. Inert ingredients may include carriers, surfactants, spray adjuvants, preservatives, dyes, and anti-foaming agents among other chemicals. An inert ingredient is simply any ingredient in the product that is not intended to affect a target plant. The designation as “inert” does not mean an additive is chemically inactive, and it does not convey any information about the toxicity of the ingredient (Tu et al. 2003; EPA 2003). Because many manufacturers consider inerts in their herbicide formulations to be proprietary, they do not list specific chemicals. Listed inert ingredients for the herbicide formulations being considered for use on the S-CNF include water, ethanol, isopropanol, isopropanolamine, kerosene, polyglycol 26-2, and polyoxyethylamine (U. S. Forest Service 1992b; 2001b; NMFS 2002). None of these chemicals are listed as Level 1 (*Inert Ingredients of Toxicological Concern*) or Level 2 (*Potentially Toxic Inert Ingredients*) compounds (EPA 2003). While there is some concern regarding the toxicity

of polyoxyethylamine (POEA), a surfactant included in a formulation of glyphosate, there is no anticipated increase in toxicity of the glyphosate formulation as a result of POEA (SERA 2003).

Adjuvants are solution additives that are mixed with a herbicide solution to improve performance of the spray mixture. Adjuvants can either enhance activity of a herbicide's active ingredient or offset any problems associated with spray application, such as adverse water quality or wind. Adjuvants include surfactants, anti-foaming agents, crop oil or crop oil concentrates, drift retardants, compatibility agents, and pH buffers. Spray adjuvants used on the S-CNF include Activator 90, Spread 90, L1700, Sylatac, R11, and MSO. Activator 90, Spread 90, and L1700 are non-ionic surfactants, meaning they have no ionic charge and are hydrophilic (water-loving). They are generally biodegradable and are compatible with many fertilizer solutions. R11 is a spreading agent that lowers the surface tension on the droplet so it covers the target plant more efficiently. MSO is a methylated seed oil adjuvant that increases the penetration of oil-soluble herbicides into a plant. It is particularly effective during drought, when leaf cuticles are thick (Tu et al. 2003). Both the herbicide and the adjuvant labels include instructions on the use of additives such as these for proper herbicide application. These additives are not hazardous or listed as Level 1 or Level 2 compounds when used as intended and label directions are followed.

Dyes used in conjunction with herbicide applications on the S-CNF include Bullseye, Insight, and Hilight. These dyes provide a bright blue color and are non-hazardous. The presence of a dye makes it far easier to see where the herbicide has been applied and where or whether it has dripped, spilled, or leaked. Dyes make it easier to detect missed spots and to avoid spraying a plant or area twice (Tu et al. 2003).

Carriers are used to dilute or suspend herbicides during application and allow for proper placement of the herbicide, whether it be to the soil or on foliage. Water is by far the most widely used carrier on the S-CNF because it is available, cheap, and the herbicides used by the S-CNF are formulated to be effectively applied with water.

Inert ingredients are not regulated by any federal agency. The Food Quality Protection Act (FQPA) of 1996 eliminates the "inert" classification, and requires EPA to review the effects of "inert" ingredients and other additives. As of early 2003, little has been done to begin testing pesticide additives and their combinations (Tu et al. 2003). However, BMPs, SOPs, and other mitigating application techniques can help prevent significant adverse environmental impacts (Tu et al. 2003).

Application of Herbicides. Herbicides would be applied according to EPA product label requirements and in accordance with directions specified in Forest Service Handbooks 2109 and 6709. All herbicide applications would be performed by, or directly supervised by, a State-certified applicator. The two types of herbicide application – ground-based and aerial – are described in the following text.

Ground-based herbicide application would occur in smaller, fragmented patches of weeds (as compared to aerial applications, described below) and along trails and roads where chemical treatment may be the most effective means of controlling or eradicating noxious and invasive non-native weeds. Those herbicides described in the previous discussion and the same criteria for selecting which herbicides to use would apply to the ground-based

application of herbicides. Methods of application would include broadcast (“block”) spraying or spot spraying with backpack pumps, spraying from a pumper unit on the back of a pickup truck or an all terrain vehicle (ATV), or using pack animals in the transport and application of herbicides in more rugged terrain. Ground-based herbicide application would only occur when wind speed is less than 10 miles per hour (mph). All herbicides would be applied according to label instructions and specifications or Forest Service policy, whichever is more restrictive. Precautionary measures associated with the ground-based application of herbicides are described in detail in this chapter in *Section 2.D.3, Management Practices and Mitigation Measures*.

Aerial herbicide application can be an effective means of controlling or eradicating very large infestations of weeds, particularly in areas that have steep slopes, rocky soils, and are difficult or lack access to effectively treat from the ground. Aerial application provides a means to effectively treat large (or small) infestations in isolated areas rapidly and efficiently, dramatically reducing the threat of further establishment or expansion. Aerial herbicide application by helicopter and/or plane could potentially occur throughout the S-CNF excluding the FCRONRW. Herbicides that would be considered for application include those chemicals currently being used in ground-based herbicide applications on the S-CNF and/or other EPA-registered and approved chemicals, as appropriate, for weed control. The herbicide(s) selected for a particular aerial treatment would depend on the same factors as described above. Aerial application would only occur when wind speed is less than 6 mph and blowing away from sensitive resources. Also, as noted above, all aerial herbicide applications would be in accordance with label instructions and specifications or Forest Service policy, whichever is more restrictive. Mitigation measures plus additional precautionary measures associated with the aerial application of herbicides are described in detail in this chapter in *Section 2.D.3, Management Practices and Mitigation Measures*.

All aviation activities would be in accordance with FSM 5700 (Aviation Management), FSM 2150 (Pesticide Use Management and Coordination), FSH 5709.16 (Flight Operations Handbook), FSH 2109.14, 50 (Quality Control Monitoring and Post-Treatment Evaluation), and the Salmon-Challis National Forest Aviation Plan. A Project Aviation Safety Plan would be developed prior to aerial spray applications.

e. Combinations of Treatments

This treatment category consists of combining several types of weed treatments using the IWM approach to provide diverse coverage for a site exhibiting a range of conditions, such as differences in species density within a broad area of infestation. This integrated approach also can be used to more effectively treat different life cycles of a single weed species. The intended effect of combining weed treatments into an integrated approach is to collectively increase the stress on a noxious weed species to the point where it dies or loses its competitive advantage and is out-competed by native vegetation. Examples of combinations of treatments include a blend of herbicide and biological controls, herbicide and mechanical controls, mechanical and biological controls, and controlled grazing and mechanical controls (U.S. Forest Service 1999a; 2001d).

2.C.2. Treatment Objectives, Priorities, and Criteria

Treatment of noxious and invasive non-native weeds will be prioritized to guide site-specific implementation so that it has the greatest effect on preventing or minimizing weed impacts on S-CNF resources. Treatment priorities assigned to different weed species are based on the following three considerations:

- A species ability to invade and displace native plant communities (for example, early growth/flowering characteristics, seed productivity, and viability)
- The potential rate of expansion (for example, seed dispersal, viability, and site susceptibility)
- The extent and proximity of susceptible native plant communities (for example, species' and communities' susceptibility to weed invasion)

Treatment objectives, priorities, and criteria for implementing weed treatments on the S-CNF are described in the following seven categories, with priority 1 the highest and priority 6 the lowest. This treatment prioritization, together with knowledge of which treatment method is most effective in achieving a treatment objective and not impacting other forest resources, will guide the site-specific implementation of weed control programs on the S-CNF. Restoration and monitoring activities associated with the treatment priorities are described in this chapter in *Section 2.C.3, Restoration and Monitoring*. The level of Forest Service funding and availability of S-CNF staff and other resources necessary for implementing weed control methods will ultimately determine the schedule for addressing treatment priority categories on the S-CNF.

Priority 1—Eradicate New Populations of Aggressive Weeds. This category has the highest treatment priority. Its objective is to eradicate new populations of aggressive weeds, including all viable seeds and vegetative propagules. Aggressive weeds are those species that can rapidly expand into native habitats and/or displace native vegetation throughout suitable sites on the S-CNF in a relatively short period of time. New populations include potential invaders (not found on the S-CNF but occur nearby), new invaders (recently found on the S-CNF), and new starts from established infestations (additional infestations found on the S-CNF). Treatments that result in the eradication of these three types of new populations of aggressive weeds will receive the highest priority. Table 2-1 lists aggressive weed species associated with known established, new, and potential weed populations that occur on or adjacent to the S-CNF. Established and new weed populations are listed according to S-CNF Ranger District, excluding the FCRONRW. This list is subject to modification based on ongoing weed detection, inventory, and monitoring activities on the S-CNF.

Priority 2—Control Existing Populations of Aggressive Weeds. The objective of this category is to reduce, over time, existing populations of aggressive weeds found on the S-CNF. "Control" is defined to collectively include preventing seed production throughout the target area; decreasing the area coverage of the weed over time; and preventing the weed from dominating the area's vegetation, but accepting low levels of the weed if elimination is not feasible.

Priority 3—Contain Existing Populations of Aggressive Weeds. The objective of this category is to hold existing populations of aggressive weeds found on the S-CNF to their current size. “Contain” is defined to collectively include preventing weeds from expanding beyond the perimeter of the infestation; perhaps providing only limited treatment within the infestation; and treating to eradicate or control the weed outside the perimeter of the infestation.

Priority 4—Eradicate New Populations of Less Aggressive Weeds. The objective of this category is to eradicate new populations of less aggressive weeds when detected on the S-CNF. The goals of eradication are the same as for aggressive weeds. Less aggressive weeds are those species that expand into native habitats more slowly and/or are less successful than Priority 1 aggressive weeds in displacing native vegetation. Table 2-1 lists less aggressive weed species associated with known established, new, and potential weed populations that occur or could potentially occur on the S-CNF. Established and new weed populations are listed according to S-CNF Ranger District. This list is subject to modification based on ongoing weed detection, inventory, and monitoring activities on the S-CNF.

Priority 5—Control Existing Populations of Less Aggressive Weeds. The objective of this category is to reduce, over time, existing populations of less aggressive weeds found on the S-CNF. “Control” is defined the same as for aggressive weeds.

Priority 6—Contain Existing Populations of Less Aggressive Weeds. The objective of this category is to hold existing populations of less aggressive weeds found on the S-CNF to their current size. “Contain” is defined the same as for aggressive weeds.

Custodial Action. In the event S-CNF funding and staffing levels are inadequate for the full implementation of the IWM program, specific treatment for a given weed infestation would be deferred until such funds and staff become available. This is defined as a “custodial” action. Under these circumstances, deferred-treatment infestations would be treated after other higher weed priorities have been addressed, assuming necessary S-CNF funds and staff are available.

Table 2-2 lists the treatment objectives and priorities according to the size of weed infestation for all known species of potential invaders and for each species of new and established invaders known to occur on the S-CNF. The size of the infestation reflects whether an infestation is new or established and thus the priority of treatment it will receive. Objectives and priorities are based on the current size (acres) of infestation. When the area of infestation for potential and new invaders exceeds 5 acres, it may be necessary to reclassify management objectives. The weed species list and associated treatment objectives and priorities in Table 2-2 are subject to modification based on ongoing weed detection, inventory, and monitoring activities on the S-CNF.

TABLE 2-1

Common and Scientific Names of Weeds that are Potential, New, and Established Invaders on Ranger Districts of the S-CNF

	Aggressiveness ²	Designation ³	Ranger District ⁴						
			Challis	Leadore	Lost River	Middle Fork	North Fork	Salmon/Cobalt	Yankee Fork
Potential Invaders ¹									
Yellow starthistle (<i>Centaurea solstitialis</i>)	A	I							
Purple loosestrife (<i>Lythrum salicaria</i>)	A	I							
Jointed goatgrass (<i>Aegilops cylindrica</i>)	LA	I							
Skeletonleaf bursage (<i>Ambrosia tomentosa</i>)	A	I							
Diffuse knapweed (<i>Centaurea diffusa</i>)	LA	I							
Meadow knapweed (<i>Centaurea pratensis</i>)	LA	I							
Poison hemlock (<i>Conium maculatum</i>)	LA	I							
Field bindweed (<i>Convolvulus arvensis</i>)	A	I							
Common crupina (<i>Crupina vulgaris</i>)	A	I							
Scotch broom (<i>Cytisus scoparius</i>)	LA	I							
Toothed spurge (<i>Euphorbia dentata</i>)	LA	I							
Meadow hawkweed (<i>Hieracium pratense</i>)	A	I							

TABLE 2-1

Common and Scientific Names of Weeds that are Potential, New, and Established Invaders on Ranger Districts of the S-CNF

	Aggressiveness ²	Designation ³	Ranger District ⁴						
			Challis	Leadore	Lost River	Middle Fork	North Fork	Salmon/Cobalt	Yankee Fork
Orange hawkweed (<i>Hieracium aurantiacum</i>)	A	I							
Perennial pepperweed (<i>Lepidium latifolium</i>)	A	I							
Milium (<i>Milium vernale</i>)	LA	I							
Eurasian watermilfoil (<i>Myriophyllum spicatum</i>)	LA								
Matgrass (<i>Nardus stricta</i>)	LA	I							
Silver nightshade (<i>Solanum elaeagnifolium</i>)	LA	I							
Buffalo bur (<i>Solanum rostratum</i>)	LA	I							
Perennial sowthistle (<i>Sonchus arvensis</i>)	LA	I							
Johnsongrass (<i>Sorghum halepense</i>)	LA	I							
Puncturevine (<i>Tribulus terrestris</i>)	LA	I							
Syrian bean caper (<i>Zygophyllum fabago</i>)	LA	I							

TABLE 2-1

Common and Scientific Names of Weeds that are Potential, New, and Established Invaders on Ranger Districts of the S-CNF

	Aggressiveness ²	Designation ³	Ranger District ⁴						
			Challis	Leadore	Lost River	Middle Fork	North Fork	Salmon/Cobalt	Yankee Fork
New Invaders ⁵									
Rush skeletonweed (<i>Chondrilla juncea</i>)	A	I					X	X	
Dalmation toadflax (<i>Linaria genistifolia</i>)	A	I	X				X	X	
Yellow toadflax (<i>Linaria vulgaris</i>)	A	I	X		X		X	X	X
Russian knapweed (<i>Acroptilon repens</i>)	A	I					X		
Sulfur cinquefoil (<i>Potentilla recta</i>)	A	L					X	X	
Hoary alyssum (<i>Berteroa incana</i>)	LA	L		#			X	X	
St. Johnswort (<i>Hypericum perforatum</i>)	LA						X		
Houndstongue (<i>Cynoglossum officinale</i>)	A	L					X	X	
Bur buttercup (<i>Ranunculus testiculatus</i>)	LA							X	
Common tansy (<i>Tanacetum vulgare</i>)	LA						X	X	
Tansy ragwort (<i>Senecio jacobaea</i>)	LA	I							X

TABLE 2-1

Common and Scientific Names of Weeds that are Potential, New, and Established Invaders on Ranger Districts of the S-CNF

	Aggressiveness ²	Designation ³	Ranger District ⁴						
			Challis	Leadore	Lost River	Middle Fork	North Fork	Salmon/Cobalt	Yankee Fork
Dyers woad (<i>Isatis tinctoria</i>)	LA	I		X			X		
Scotch thistle (<i>Onopordum acanthium</i>)	LA	I						X	
Field pennycress (<i>Thlaspi arvense</i>)	LA							X	
Blue mustard (<i>Chorispora tenella</i>)	LA								
Established Invaders⁶									
Spotted knapweed (<i>Centaurea maculosa</i>)	A	I	X	X	X	X	X	X	X
Canada thistle (<i>Cirsium arvense</i>)	A	I		X	X		X	X	X
Musk thistle (<i>Carduus nutans</i>)	LA	I	X	X	X		X	X	
Bull thistle (<i>Cirsium vulgare</i>)	LA				X		X	X	
Leafy spurge (<i>Euphorbia esula</i>)	A	I	X	X	X		X	X	
Black henbane (<i>Hyoscyamus niger</i>)	LA	I		X	X		X	X	
Cheatgrass (<i>Bromus tectorum</i>)	LA		Widely distributed in all Ranger Districts						

TABLE 2-1

Common and Scientific Names of Weeds that are Potential, New, and Established Invaders on Ranger Districts of the S-CNF

	Aggressiveness ²	Designation ³	Ranger District ⁴						
			Challis	Leadore	Lost River	Middle Fork	North Fork	Salmon/Cobalt	Yankee Fork
Hoary cress (whitetop) (<i>Cardaria draba</i>)	LA	I		X	X			X	
Common mullein (<i>Verbascum thapsus</i>)	LA		Occurs in isolated, small populations in all Ranger Districts						

¹Potential invaders are not currently present on the Salmon-Challis National Forest but are present in surrounding counties or states. The potential for their establishment on the S-CNF is high.

²A = aggressive weed species with the ability to rapidly displace native vegetation.

LA = less aggressive weed species that usually do not rapidly invade and displace native plant communities or that may invade in some circumstances but that are not likely to aggressively invade the S-CNF.

³I = State of Idaho listed as a noxious weed.

L = Lemhi County listed as a noxious weed.

⁴"X" indicates a species is present on the specified Ranger District. "#" indicates a species is believed to be present but has not actually been observed.

⁵New invaders are present on the Salmon-Challis National Forest but are limited in distribution and numbers of locations. The potential for their further expansion on the S-CNF is high to very high.

⁶Established invaders are present in high densities or are widely distributed on the S-CNF. The potential for their further expansion on the S-CNF is very high.

TABLE 2-2

Treatment Objectives and Priorities by Weed Species and Size of Infestation¹

Weed Species	Size of Infestation			
	<1 Acre	1-5 Acres	>5-25 Acres	>25 Acres ²
Potential Invaders	Eradicate	Eradicate		
New Invaders				
Rush skeletonweed	Eradicate	Eradicate		
Dalmation toadflax	Eradicate	Eradicate		
Yellow toadflax	Eradicate	Eradicate		
Russian knapweed	Eradicate	Eradicate		
Sulfur cinquefoil	Eradicate	Eradicate		
Hoary alyssum	Eradicate	Eradicate		
St. Johnswort	Eradicate	Eradicate		
Houndstongue	Eradicate	Eradicate		
Bur buttercup	Eradicate	Eradicate		
Common tansy	Eradicate	Eradicate		
Tansy ragwort	Eradicate	Eradicate		
Dyers woad	Eradicate	Eradicate		
Scotch thistle	Eradicate	Eradicate		
Field pennycress	Eradicate	Eradicate		
Blue mustard	Eradicate	Eradicate		
Established Invaders				
Spotted knapweed	Eradicate	Eradicate	Control	Control/Contain
Canada thistle	Eradicate	Eradicate	Control	Contain
Musk thistle	Eradicate	Control	Contain	Contain
Bull thistle	Control	Control	Contain	Contain
Leafy spurge	Eradicate	Eradicate	Control	Contain
Cheatgrass	Eradicate	Eradicate	Contain	Contain
Black henbane	Eradicate	Control	Contain	Contain
Hoary cress (whitetop)	Eradicate	Eradicate	Contain	Contain
Common mullein	Control	Control	Contain	Contain

¹Reclassification of treatment objectives may be necessary when infestations of potential and new invaders exceed 5 acres.

²If S-CNF funding and staffing levels are limited, specific treatment of infestations of established invaders greater than 25 acres will be deferred (custodial action) until after other higher weed treatment priorities have been addressed.

2.C.3. Restoration and Monitoring

Restoring and monitoring a treated area following the application of weed treatments described above are integral components of an IWM program. The extent and rigor with which these components can be implemented depends on the annual funding levels and staff available to the S-CNF. Restoration activities will also depend on the physical and biological characteristics of the treatment area and the degree of disturbance. The S-CNF wants to encourage natural regeneration where possible and would only consider restoration where the degree of disturbance and physical and biological characteristics dictate restoration is necessary. Restoration and monitoring techniques and objectives are described in the following text.

Site restoration consists of restoring treated areas with desired vegetation. Objectives include revegetating sites after weeds have been eradicated, controlled, or contained; preventing future weed infestations or reinfestations; and slowing the expansion of existing adjacent weed infestations. Revegetation with diverse communities that fill all the niches, especially soil niches and barren sites, makes sites more impermeable to future weed infestations, because noxious weeds often invade open sites where there is no competing vegetation. Site restoration techniques have the effect of increasing the competitive advantage of desirable species and decreasing the competitive advantage of undesirable species. An example of this technique includes planting a diverse mix of desired species (native and desired non-native plants or seeds, consistent with S-CNF policy, where it is known that non-native species would not be a problem) at optimum densities to allow them to compete with weeds and not each other. Other examples of site restoration techniques include retaining brush and tree canopy to shade out weeds; seeding grasses and forbs, then cautiously fertilizing sites that have sparse ground cover; and irrigating treated, revegetated sites where appropriate and feasible. In addition to these techniques, controlled grazing could possibly be managed to favor later rather than early successional stages of native vegetation. The above restoration techniques also could potentially be used to prevent or retard the initial invasion of weeds into uninfested areas.

Monitoring activities would comply with FSH 2109.14 Chapter 50 guidelines and include implementation and effectiveness monitoring. Implementation monitoring is performed during treatment and recorded on the pesticide application report to indicate the appropriate treatment application standards and mitigation measures were followed. Treated and restored sites would be monitored for effectiveness through field investigations to determine the following: 1) whether the desired management objectives of eradicating, controlling, or containing aggressive weeds were achieved; 2) whether site restoration techniques have resulted in the re-establishment of native plants; and if not, what follow-up treatments would be necessary to achieve establishment; and 3) whether the native vegetation has adequately responded in non-restored treatment areas to provide for adequate site protection; and, if not, what follow-up restoration treatments are necessary.

Treatment method and date, target species, and monitoring results would be recorded for each treatment site to compile a long-term database on treatment effectiveness under various conditions.

Monitoring the effectiveness of mitigation measures and buffer zones would also be initiated. A monitoring plan would be developed encompassing either the entire S-CNF or

specific to the individual Ranger Districts that describes both the qualitative and quantitative monitoring protocols. Water quality sampling would be incorporated as necessary to monitor the effectiveness of the riparian and stream buffer zones. Upland sites would be selected to monitor the effectiveness of the mitigation measures and buffer zones on sensitive plant populations and impacts to non-target native species.

Monitoring also would be used to gather data on any new or expanding weed infestations, the density and rate of spread, apparent resultant effects on other S-CNF resources, and the appropriate treatment prioritization and treatment method. Data recorded would include weed location, date of discovery, species, condition, and distribution.

2.C.4. Adaptive Strategy

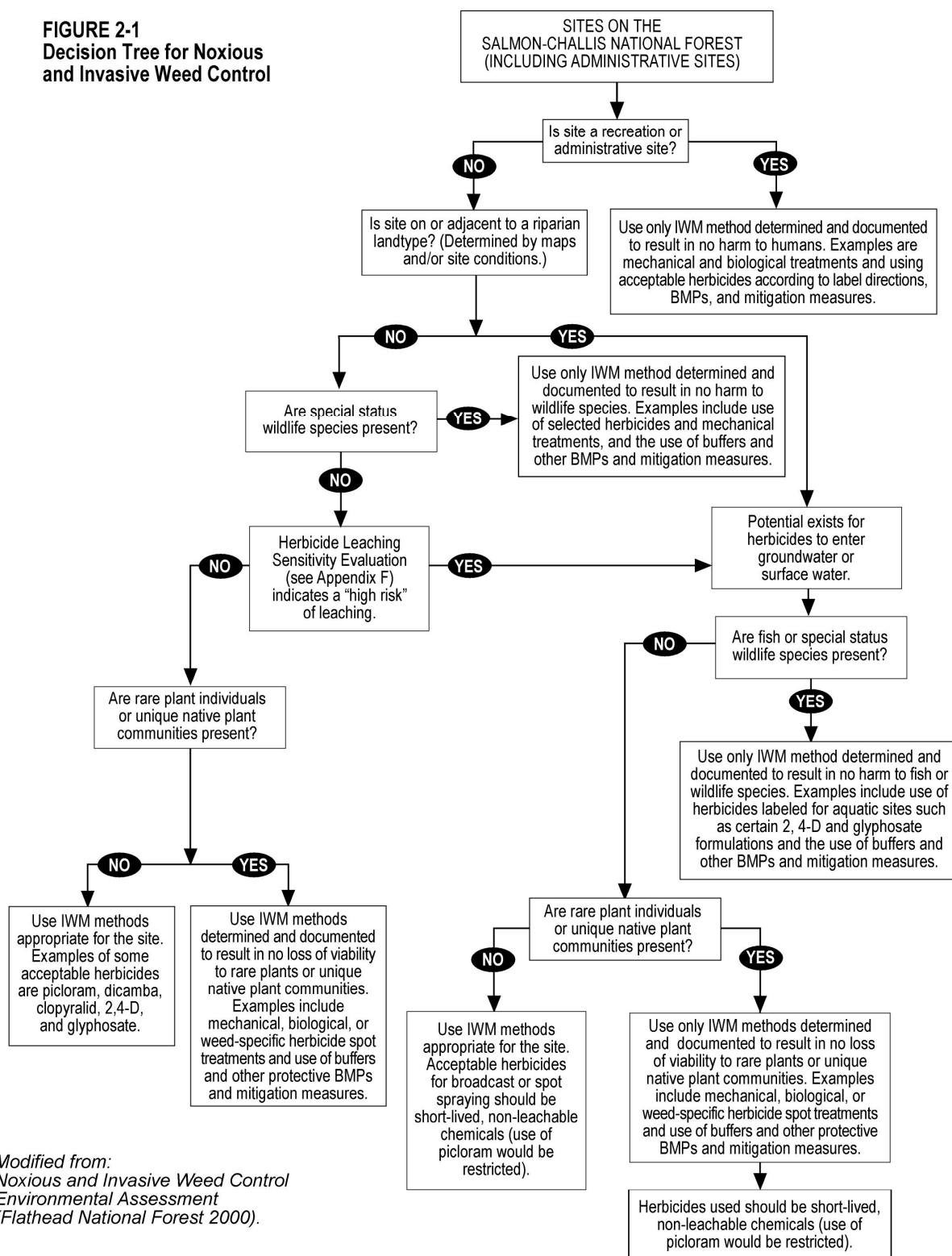
An adaptive weed management strategy would be used to determine appropriate future treatments on the S-CNF if new weed infestations are discovered or existing infestations expand. An adaptive strategy also would be used to treat currently known but uninventoried infestations of weeds. Adaptive strategies would be developed from lessons learned as each site is treated. Additionally, lessons learned by other agencies and CWMAs can also be adapted for new and potential infestations.

The future weed species list for the S-CNF would include any new species not presently identified as occurring, or potentially occurring, on the S-CNF; any new federal-, state-, or county-designated species of noxious weeds; and any non-designated nuisance, non-native weeds that would be considered for treatment on a site-specific basis. Treatment methods would be adapted to the location, species, and priorities described in *Section 2.C.2, Treatment Objectives, Priorities, and Criteria*, and *Section 2.C.6, Site-Specific Implementation Process*, in this chapter. This evolving, site-specific aspect of adaptive management will allow S-CNF managers to learn from past actions, improve effectiveness of future actions, and reduce impacts beyond those known today.

For example, the amount of herbicide applied would be reduced if monitoring indicates effective invasive weed control and less impact on non-target species could be achieved at reduced application rates at other sites. Another example may be that if monitoring reveals undesirable non-target impacts on forbs from spring herbicide applications, herbicides might instead be applied during summer or fall if they are also effective on the target species.

The adaptive strategy process would include determining the weed species present, level of aggressiveness, and infestation size; the proximity to potentially susceptible habitats, sensitive resources, or uses such as recreation, wildlife, aquatic, and special-status vegetation species (see the site-specific decision tree depicted in Figure 2-1); establishing the treatment priority level; and selecting a treatment method based on weed species ecology, likelihood of success, cost-effectiveness, and management objective (eradicate, control/reduce, contain, and custodial). Monitoring, assessing the need for follow-up treatment, and site restoration also would be a part of the adaptive strategy process. In addition, non-treatment practices associated with managing current weed infestations (weed prevention, information/education, cooperative partnerships, inventory and early detection, legal compliance, and mitigation measures), which are discussed further below, would continue under an adaptive strategy.

FIGURE 2-1
Decision Tree for Noxious
and Invasive Weed Control



For example, a new infestation of spotted knapweed less than 1 acre in size is discovered. Spotted knapweed is an aggressive weed: Table 2-1 indicates a Priority 1 designation for the species. Table 2-2 directs eradication as the preferred treatment objective. Preferred treatment options for eradication are mechanical and herbicide as noted in Table 2-3. Under adaptive strategy, prior treatments would be reviewed to determine which method most effectively treated the population. Additionally, the herbicide leaching sensitivity evaluation (see Appendix F) and decision tree (see Figure 2-1) are reviewed to identify site-specific limitations and available options based on sensitive resources and physical characteristics.

Another use of the adaptive strategy occurs when new or potential species invade from existing infestations outside the S-CNF. Appendix C describes potential invaders and preferred treatment options. In addition to the review described above, the adaptive strategy would include consultations with other management groups, including CWMAs, to identify and implement the most effective eradication methods. The adaptive strategy mixes treatment lessons learned on the S-CNF with those learned beyond Forest boundaries. Thus, treatment alternatives are maximized.

The scope of this EIS is intentionally broad relative to the issues and geographic scale analyzed in order to provide a basis for the coverage of future weed treatments using an adaptive strategy.

2.C.5. Minimum Tool

The management of noxious and invasive non-native weeds on the S-CNF will incorporate the “minimum tool” approach, where practical. This approach means that S-CNF managers will use the minimum necessary weed treatment method or methods to accomplish management objectives associated with different treatment priorities. For example, some mechanical, biological, and chemical treatment methods may be equally effective in eradicating, controlling, or containing a particular weed species or infestation, depending on treatment objective and priority. In such instances, the method that would least impact S-CNF resources, uses, and values would be used in the minimum tool approach. Treatment method choices are listed in Table 2-3 for species of established, new, and potential invaders according to the size of the infestation, with additional detailed supporting information on treatment choices presented in Appendix C. The effectiveness of a treatment method varies widely, depending on numerous factors. For example, hand-pulling may be effective for some weed species but not for deeply rooted and rhizomatous species or for large infestations. Biological controls are not yet available for many species of non-native weeds and generally are not effective on localized isolated infestations. In a number of situations, the use of herbicides may be the only effective tool for achieving treatment objectives and priorities and in those instances would represent the “minimum tool.”

The minimum tool approach would be used on a site-specific basis according to the process described below in *Section 2.C.6, Site-Specific Implementation Process*.

2.C.6. Site-Specific Implementation Process

A number of steps would be followed under the Proposed Action and alternatives to determine and implement the most appropriate treatment method for a site-specific weed infestation. They include the following:

- Detection of the weed
- Prioritization of weed treatment at a particular site
- Determination if sensitive environmental receptors are present
- Determination of the appropriate treatment method for the weed
- Restoring then monitoring the treatment site to determine if follow-up or alternative treatment is warranted

Following detection of a weed or weed population, the primary factors for treatment prioritization would be the information shown in Table 2-2. Treatment prioritization is based on the status of the population (potential, new, or established invaders) and the size of the infestation. Highest priority would be given to stopping potential invaders before they can become established on the S-CNF. New invaders, usually having a small patch size, would have the second highest priority, followed by established invaders. The degree and intensity of treatment recommended in Table 2-2 is based on the importance the S-CNF places on limiting the spread of each weed species and the size of the infestation.

Table 2-2 lists the weed treatment priorities and objectives, but other factors must be considered on a site-specific basis, because more than one treatment method may be available to meet the management objective and sensitive environmental receptors may need protection. Preferred available (but not mandatory) treatment methods for a specific weed are shown in Table 2-3. The four primary site-specific environmental evaluation factors used to select the most appropriate treatment are the presence of water, soil characteristics, presence of sensitive receptors, and plant community parameters. The water factors of interest are whether the site is adjacent to surface water and if the site has a high groundwater table. Soil characteristics of interest are texture and organic matter content. Sensitive receptors include recreation areas, administrative sites, fish populations, and special-status wildlife populations. Plant community factors include the presence of special-status species, presence of unique plant communities, and relative abundance of native vegetation.

After the weed treatment priority and objective have been determined for a specific infestation, the decision tree (Figure 2-1) would be used as a guide to determine the most appropriate treatment method (mechanical, biological, controlled grazing, chemical, or combinations). The herbicide leaching sensitivity evaluation (Appendix F), which evaluates several physical characteristics for leaching potential, would be used in conjunction with the decision tree to aid in this determination. The evaluation of leaching potential is for use on upland sites only. It will be used before all herbicide applications on the S-CNF to evaluate the site conditions influencing the risk of leaching through the soil. Riparian areas would receive special treatment as outlined in the decision tree shown as Figure 2-1.

A special-status plant assessment or field survey would be conducted prior to determining the most appropriate treatment method or in treating a previously untreated weed site. These results would be documented and incorporated into use of the decision tree. The following criteria related to the Endangered Species Act (ESA) would be used to assist in selecting a treatment method:

- If a non-federally listed special-status plant species is located, the treatment method must have “no impact” on the plant or “may impact individuals or habitat, but will not likely contribute to a trend toward federal listing, or cause a loss of viability to the population or species.”
- If a federally listed plant is located, all treatment methods would be required to have “no effect” or “may affect but not likely to adversely affect” the plant.

The following are examples of the type of factors used in the decision tree and the leaching sensitivity evaluation to select the appropriate treatment method:

- Presence of sensitive receptors
- Presence of unique plant communities
- Soil texture
- Soil organic matter content
- Distance to groundwater
- Distance to surface water

The appropriate treatment method is indicated at the bottom of the decision tree (see Figure 2-1). This site-specific approach to treating weed infestations embraces the minimum tool concept that was discussed in *Section 2.C.5*. It is designed for present use as well as future use under the adaptive weed management strategy that was discussed in *Section 2.C.4*. This approach also incorporates all of the identified BMPs, mitigation measures, and SOPs, depending on the alternative listed in *Section 2.D.3* and Appendix A.

The site-specific approach is closely related to strategies discussed in *Section 2.C, Integrated Weed Management*. Using the spotted weed example from *Section 2.C.4, Adaptive Strategy*, site-specific information would be used to evaluate treatment methods. If the new spotted knapweed infestation occurred in steep and rocky terrain, for example, information in Table 2-3 and the decision tree would be used to determine if a particular treatment method offered aggressive eradication in terms of the infestation size, weed species, and location but ensured resource protection. For example, if the infestation were small, and near sensitive areas, herbicide spot treatments with short-lived non-leachate chemicals would be the preferred treatment and applied in accordance with all of the identified BMPs, mitigation measures, and SOPs.

2.D. Alternatives Analyzed in Detail

A Proposed Action, two other action alternatives, and a No Action Alternative for the proposed S-CNF Noxious Weed Management Program were analyzed in detail. They are described below and include the following:

- No Action Alternative (No Change from Current Management)

- Proposed Action—Aerial and Ground-Based Herbicide Applications Plus Mechanical, Biological, Controlled Grazing, and Combinations of Treatments
- Alternative 1—Ground-Based Herbicide Application Plus Mechanical, Biological, Controlled Grazing, and Combinations of Treatments (No Aerial Herbicide Application)
- Alternative 2—Mechanical, Biological, Controlled Grazing, and Combinations of Treatments (No Herbicide Application)

The Proposed Action was selected by the S-CNF Weed EIS Content Analysis Team following further review of the six preliminary alternatives presented at the public scoping meetings, evaluation of comments received from the public on alternatives and components of alternatives for the proposed project, and an assessment of which action alternative appeared to best meet the near- and long-term weed management goals for the S-CNF as defined in the project purposes and needs. For each alternative analyzed in detail, vegetative treatments were combined with site restoration activities rather than keeping them as a separate set of weed treatments, because vegetative treatment (in some form) becomes the restoration action.

Alternatives that were considered but eliminated from detailed analysis are described in *Section 2.E, Alternatives Considered but Eliminated from Detailed Analysis*, of this chapter.

2.D.1. Features Common to All Alternatives

a. Non-Treatment Practices

Non-treatment practices are centered around proactive weed prevention and educational programs. As discussed in *Section 1.A.1, Integrated Weed Management*, they are a cornerstone of IWM programs and essential to successfully managing noxious and invasive non-native weeds. A number of non-treatment practices would continue as an integral component of IWM under each of the four alternatives analyzed in detail. These practices include weed prevention; weed inventory and early detection; information and education programs; cooperative partnerships and coordination; and compliance with laws, orders, policies, and Forest Plans. Appendix A provides detailed descriptions of BMPs for weed prevention and management that are followed by Region 4 of the Forest Service and that would continue to be followed on the S-CNF under all of the alternatives analyzed in detail.

2.D.2. Descriptions of Alternatives Analyzed in Detail

The acres and number of sites of inventoried weed infestations that would potentially be treated using various treatment options were estimated using a variety of data sources. The resulting distribution of treatment options that were considered to be potentially the most successful and efficient means for treating all of the inventoried weed infestations on the S-CNF (66,537 acres at 2,724 sites) are listed later in this section in Table 2-5. The distributions of treatment options on the S-CNF are presented later in this section in Table 2-6 assuming an estimated annual treatment rate of approximately 18,000 acres per year for the Proposed Action, Alternative 1, and Alternative 2, and an estimated annual treatment rate of approximately 3,500 acres per year for the No Action Alternative. Table 2-6 provides a comparison of the various treatment options among all the alternatives on an annual basis and provides a basis for analyzing potential impacts. The various data sources

used to compile these tables are described, as follows. Table 2-1 listed known potential, new, and established populations of weed species that occur on or adjacent to the S-CNF. Table 2-2 listed treatment objectives and priorities for these known weed species according to size of infestation and their level of aggression. Appendix B presents detailed information on the number and acres of inventoried weed infestations on the S-CNF by weed species, size of infestation, and location (Ranger District and Hydrologic Unit Codes [HUCs] 4 and 5). Map 2-2 (back of Chapter 2) depicts the locations of 4th and 5th order HUCs and Ranger Districts on the S-CNF and Table 2-4 lists the names of those HUCs. The S-CNF maintains detailed data and Geographic Information System (GIS) files on the species, size, and location of each inventoried noxious weed infestation occurring on and immediately adjacent to the S-CNF. Appendix C presents information on possible treatment methods available for the known potential, new, and established populations of weed species that occur on or adjacent to the S-CNF. Table 2-3 summarizes the preferred available treatment methods from Appendix C according to weed species and size of infestation that could potentially be used to achieve treatment objectives and priorities listed in Table 2-2.

TABLE 2-3

Preferred Available Treatment Methods by Weed Species and Size of Infestation^{1, 2, 3}

Weed Species	Infestation <1 Acre	Infestations 1-5 Acres	Infestations 5-25 Acres	Infestations > 25 Acres ⁴
Potential Invaders	(See Appendix C for all treatment methods available for eradicating species of potential invaders.)			
New Invaders				
Rush skeletonweed	Mechanical and herbicide	Mechanical or biological		
Dalmatian toadflax	Mechanical and herbicide	Mechanical and herbicide		
Yellow toadflax	Mechanical and herbicide	Mechanical and herbicide		
Russian knapweed	Herbicide	Herbicide		
Sulfur cinquefoil	Mechanical or herbicide	Herbicide		
Hoary alyssum	Mechanical or herbicide	Mechanical or herbicide		
St. Johnswort	Biological, herbicide, or mechanical	Biological, herbicide, or mechanical		
Houndstongue	Mechanical or herbicide	Mechanical or herbicide		
Bur buttercup	Herbicide	Herbicide		
Common tansy	Herbicide	Herbicide		
Tansy ragwort	Herbicide	Herbicide		
Dyer's woad	Herbicide or mechanical	Herbicide or mechanical		

TABLE 2-3Preferred Available Treatment Methods by Weed Species and Size of Infestation^{1, 2, 3}

Weed Species	Infestation <1 Acre	Infestations 1-5 Acres	Infestations 5-25 Acres	Infestations > 25 Acres⁴
Scotch thistle	Mechanical or herbicide	Mechanical, herbicide, or biological		
Field pennycress	Herbicide or mechanical	Herbicide or mechanical		
Blue mustard	Herbicide or mechanical	Herbicide or mechanical		
Established Invaders				
Spotted knapweed	Herbicide or Mechanical	Herbicide	Biological and herbicide	Biological and herbicide
Canada thistle	Herbicide	Herbicide	Biological	Biological
Musk thistle	Herbicide	Biological or mechanical	Biological or mechanical	Biological or mechanical
Bull thistle	Mechanical	Mechanical	Mechanical and biological	Mechanical and biological
Leafy spurge	Grazing and herbicide or mechanical and herbicide	Grazing and herbicide or mechanical and herbicide	Grazing and herbicide; mechanical and herbicide; or biological and herbicide	Grazing and herbicide mechanical and herbicide, or biological and herbicide
Black henbane	Mechanical or herbicide	Herbicide	Herbicide	Herbicide
Cheatgrass	Herbicide or mechanical	Herbicide or mechanical	Herbicide or mechanical	Herbicide or mechanical
Hoary cress (whitetop)	Mechanical and herbicide	Mechanical, grazing, and herbicide	Herbicide, mechanical, or grazing	Herbicide, mechanical, or grazing
Common mullein	Mechanical	Mechanical	Biological	Biological and herbicide

¹Derived from interpreting the treatment methods described in Appendix C and incorporating the minimum tool concept.

²The preferred available treatment methods are not necessarily the most effective treatment nor the required treatment method. Conditions that affect or limit the effectiveness of these treatment methods are described in *Section 2.C.1, Treatment Practices*.

³Cultural treatments would be used to restore/revegetate sites following initial mechanical, biological, grazing, and/or herbicide treatments.

⁴If funding and staffing levels are limited, specific treatment of infestations of established invaders greater than 25 acres may be deferred (custodial action) until after other higher weed treatment priorities have been addressed.

For purposes of conducting a “worst-case” analysis in Chapter 4, Environmental Consequences, it was assumed that the treatment method listed in Table 2-3 that could

potentially have the greatest impact on S-CNF resources would be used to treat weed infestations. Those treatments that could also achieve treatment objectives but potentially have less impact on S-CNF resources would represent the minimum tool. The minimum tool (described in *Section 2.C.5*) would be selected during the site-specific implementation process, described in *Section 2.C.6*.

TABLE 2-4
HUC 4 and 5 Watershed Identification Key for the S-CNF

HUC 4: Upper Salmon	
0101	Morgan Creek
0102	Challis Creek
0103	Grandview
0104	Bayhorse
0105	Lower East Fork
0106	Big Lake/Boulder
0107	Upper East Fork
0108	Squaw/Slate
0109	Warm Springs
0110	Casino/Basin
0111	Redfish Lake Creek
0112	Headwaters Salmon
0113	Alturas Lake Creek
0114	Valley Creek
0115	Yankee Fork
HUC 4: Pahsimeroi	
0201	Lower Pahsimeroi
0202	Middle Pahsimeroi
0203	Big Creek
0204	Upper Pahsimeroi
HUC 4: Middle Salmon-Panther	
0301	Colson-Owl
0302	Shoup
0303	Indianola
0304	Deadwater
0305	North Fork
0306	Red Rock
0307	Salmon
0308	Twelve/Lake
0309	Iron Creek
0310	Hat Creek

TABLE 2-4
HUC 4 and 5 Watershed Identification Key for the S-CNF

0311	Lower Panther Creek
0312	Middle Panther
0313	Napias
0314	Deep-Moyer
0315	Upper Panther
HUC 4: Lemhi Basin	
0401	Lower Lemhi
0402	Tendoy
0403	Middle Lemhi
0404	Eighteen Mile
0405	Timber Creek
0406	Hayden
HUC 4: Upper Middle Fork Salmon	
0501	Lower Loon Creek
0502	Warm Springs Creek
0503	Upper Loon Creek
0504	Thomas-Little Loon
0505	Rapid River
0506	Dagger Falls
0507	Marsh Creek
0508	Bear Valley
0509	Elk Creek
0510	Sulphur Creek
0511	Pistol Creek
0512	Indian Creek
0513	Marble Creek
HUC 4: Lower Middle Fork Salmon	
0601	Impassable Canyon
0602	Brush-Wilson
0603	Lower Camas Creek
0604	Yellowjacket
0605	Upper Camas Creek
0610	Cabin-Canyon
0611	Rush Creek
0612	Crooked-Buck
0613	Monumental Creek

TABLE 2-4
HUC 4 and 5 Watershed Identification Key for the S-CNF

0614	Beaver-Gold
0615	Upper Big Creek
HUC 4: Middle Salmon-Chamberlain	
0701	Fall-Johnson
0703	California-Bull
0706	Fivemile-Rhett
0709	Dillinger-Big Squaw
0711	Disappointment-Ltl Squaw
0712	Horse Creek
0713	Corn-Kitchen
0714	Cottonwood Creek
0715	Chamberlain Creek
0716	McCalla Creek
0717	Warren Creek
HUC 4: Little Lost	
1701	Little Lost Sinks
1702	Lower Little Lost
1703	Middle Little Lost
1704	Upper Little Lost
HUC 4: Big Lost	
1801	Dry Channel Big Lost Riv.
1802	Arco
1803	Antelope Creek
1804	Mackay
1805	Willow Creek
1806	East Fork Big Lost River
1807	North Fork Big Lost River

a. No Action Alternative (No Change from Current Management)

Under the proposed S-CNF Noxious Weed Management Program, the No Action Alternative would continue the same weed management programs, treatments, and levels of effort for controlling noxious weeds on the S-CNF as are currently being used. Current weed management is conducted according to the Forest Service's IWM Program, and is authorized by the Findings of No Significant Impact, Decision Notices, and Environmental Assessments for the Challis National Forest (U.S. Forest Service 1989) and Salmon National Forest (U.S. Forest Service 1987b) noxious weed control programs. Weed treatments on the

S-CNF were very limited prior to 1995. Since then, acres of lands treated have generally increased each year from 586 acres in 1995 to 3,371 acres in 2001. Virtually all of these acreages were treated using herbicides. Monitoring has been geared toward program implementation and measuring the effectiveness of treatments on target species. Major IWM activities on the S-CNF that would continue under the No Action Alternative include the following:

- Maintaining noxious weed prevention, education, and public awareness programs
- Treating about 3,000 to 3,500 acres of target noxious weeds each year
- Eradicating new invaders using herbicides and other treatment methods
- Controlling and reducing the spread of established weed infestations
- Coordinating with counties and state agencies to determine priorities and develop uniform treatment strategies

Herbicide applications would continue to be ground-based. Herbicide treatments would continue to include the use of 2,4-D, glyphosate, picloram, and dicamba (U.S. Forest Service 1987b; 1989). All herbicide applications would be in accordance with label instructions and specifications or U.S. Forest Service policy, whichever is more restrictive. The proportion of the acreage treated with a particular chemical, biological, or mechanical method would vary from year to year depending on various factors, such as the species of weed, its aggressiveness, whether it is a new or established invader, and the location and size of the infestation. Mitigating BMPs and SOPs that would be implemented under the No Action Alternative are described in *Section 2.D.3, Management Practices and Mitigation Measures* in this chapter and in Appendix A.

The current noxious weed management program for the S-CNF fulfills the need to develop relationships with local and state agencies and complies with current federal and state law. However, recent watershed analyses show that weed infestations continue to plague the S-CNF. The current level of weed treatment is considerably less than known weed infestations (greater than 66,000 acres) on the S-CNF. New invaders continue to establish populations on the S-CNF, and would likely increase in size unless a more aggressive noxious weed management program than that associated with the No Action Alternative is developed and implemented.

The No Action Alternative does not include a forest-wide action plan to reduce or eliminate the spread of weeds on the S-CNF. It also does not include an adaptive weed management strategy or a minimum tool approach. Site restoration and monitoring activities would be limited in scope. Expanding target species, treatment acres, or choice of chemical would require further NEPA analysis and documentation. This would constrain S-CNF managers from responding in a timely and cost-effective manner to new weed infestations.

b. Proposed Action—Aerial and Ground-Based Herbicide Applications Plus Mechanical, Biological, Controlled Grazing, and Combinations of Treatments

The management objective of the Proposed Action is to maximize the treatment of noxious weeds throughout the S-CNF as quickly as reasonably possible to protect the forest and its resources. This would be accomplished using the full array of treatment (*Section 2.C.1*) and

non-treatment (*Section 1.A.1 and Section 2.D.1.a*) practices described previously, site restoration and revegetation (where appropriate) and monitoring programs (*Section 2.C.3*), implementing all mitigating BMPs and SOPs described further in this chapter (*Section 2.D.3*) and in Appendix A, employing a site-specific minimum tool approach (*Section 2.C.5*) and site-specific implementation process (*Section 2.C.6*), and following an adaptive strategy (*Section 2.C.4*) in managing future weed infestations. The Proposed Action includes both ground and aerial application of herbicides. A maximum of 15,000 treatment acres per year of herbicides would occur either through ground application or through aerial application. Treatment locations may either be initial (first time) or follow-up treatments in previously treated areas. The distribution of treatment acres between ground application and aerial applications would likely vary on a yearly basis, however, it is expected that ground application would dominate. Aerial herbicide application opportunities will be considered throughout the project area primarily on steep slopes, rocky soils, where access is physically limited, restricted, or hazardous, and where aerial application is the most efficient and cost-effective method. The criteria used to evaluate the proposed aerial application sites include: slopes greater than 50 percent accessibility, proximity to private land (greater than one-half mile), sites with high weed density (greater than 25 percent cover), and size of infestation (greater than 5 acres). Map 2-3 (back of Chapter 2) depicts weed locations meeting these aerial application evaluation criteria.

Table 2-6 lists the acres of weed infestations on the S-CNF that would potentially be treated annually using the various available treatment options under the Proposed Action. The acre estimates and treatment options presented in Table 2-6 are based on the species of weeds present, their degree of aggressiveness, and the sizes and numbers of their infestations (refer to Table 2-1 and Appendix B); corresponding treatment priorities and objectives aimed at eradicating, controlling, and/or containing weeds (refer to Table 2-2); treatment methods available for various species of weeds (refer to Table 2-3 and Appendix C); and an estimated annual treatment of 18,000 acres of weeds on the S-CNF.

The expected time frames and goals for accomplishing the Proposed Action management objective would vary depending on the extent and severity of weed infestations. As shown in Table 3-1 in Chapter 3, known acres of weed infestations are considerably greater on the North Fork and Salmon-Cobalt Ranger Districts (primarily spotted knapweed infestations) than on the other five Ranger Districts within the S-CNF and may, therefore, require more time to achieve weed management goals. The following management goals are proposed for the S-CNF Ranger Districts:

- Eradicate all new starts (less than 5 acres in size) of aggressive weeds.
- Reduce established infestations of aggressive weeds 5 to 25 acres in size by 75 to 100 percent.
- Reduce established infestations of aggressive weeds greater than 25 acres in size by 50 percent.
- Eradicate all new starts (less than 5 acres in size) of less aggressive weeds.
- Reduce infestations of less aggressive weeds greater than 5 acres in size by 50 percent.

- Implement site restoration and revegetation actions (where appropriate) and monitoring programs following treatment to reduce or eliminate the subsequent reinvasion of weeds and to measure the degree of treatment success.
- Employ the minimum tool approach and an adaptive strategy using the site-specific implementation process.

The period of weed treatment for the Proposed Action would continue until a change in weed conditions on the S-CNF becomes evident, consistent with the proposed weed management goals. As stated previously, it is assumed for purposes of this analysis that full funding would be available for implementing the Proposed Action to work toward achieving those goals.

c. Alternative 1—Ground-Based Herbicide Application Plus Mechanical, Biological, Controlled Grazing, and Combinations of Treatments (No Aerial Herbicide Application)

The management objective of Alternative 1 is similar to the Proposed Action, except that it would not include the aerial application of herbicides and is, therefore, less aggressive than the Proposed Action. The approximately 15,000 acres per year that would be chemically treated from both ground and air applications under the Proposed Action would instead be treated under Alternative 1, to the extent possible, using a combination of ground-based herbicide application plus primarily biological treatments. This affects the timeframe and degree of success that would be anticipated on large infestations of weeds in the S-CNF. Except for this difference, all other treatment components and processes described for the Proposed Action would be implemented under Alternative 1. These include the full array of treatment (*Section 2.C.1*) and non-treatment (*Section 1.A.1* and *Section 2.D.1.a*) practices (except for aerial herbicide application), site restoration and revegetation (where appropriate) and monitoring programs (*Section 2.C.3*), implementing all mitigating BMPs and SOPs except those associated with aerial herbicide application (*Section 2.D.3* and Appendix A), employing a site-specific minimum tool approach (*Section 2.C.5*) and site-specific implementation process (*Section 2.C.6*), and following an adaptive strategy (*Section 2.C.4*) in managing future weed infestations.

Table 2-6 lists the acres of weed infestations on the S-CNF that would potentially be treated annually using the various available treatment options under Alternative 1. Weed management goals would be similar to the Proposed Action except for established infestations of aggressive weeds 5 to 25 acres in size and greater than 25 acres in size in all Ranger Districts. Differences in management goals between Alternative 1 and the Proposed Action would be greatest in the North Fork and Salmon/Cobalt Ranger Districts where the largest and continuous blocks of weed infestations suitable for aerial application are located. A combination of biological and ground-based chemical methods rather than aerial herbicide application would be used to treat the numerous large infestations of spotted knapweed. These large weed infestations would be more difficult to access and the treatment less effective, and would require more time to treat compared to aerial herbicide applications. Because of this, the proposed weed management goals under Alternative 1 would be to contain rather than reduce infestations greater than 25 acres on the North Fork and Salmon/Cobalt Ranger Districts, and to reduce infestations greater than 5 acres by a smaller percentage than under the Proposed Action on the Challis, Leadore, Lost River, Middle Fork, and Yankee Fork Ranger Districts. Because of these and other differences

described below and reduced management expectations, the following separate sets of management goals are proposed for the S-CNF Ranger Districts under Alternative 1:

Weed management goals proposed for the Challis, Leadore, Lost River, Middle Fork, and Yankee Fork Ranger Districts:

- Eradicate all new starts (less than 5 acres in size) of aggressive weeds.
- Reduce established infestations of aggressive weeds 5 to 25 acres in size by 25-50 percent.
- Reduce established infestations of aggressive weeds greater than 25 acres in size by 25 percent.
- Eradicate all new starts (less than 5 acres in size) of less aggressive weeds
- Reduce infestations of less aggressive weeds greater than 5 acres in size by 50 percent.
- Implement site restoration and revegetation actions (where appropriate) and monitoring programs following treatment to reduce or eliminate the subsequent reinvasion of weeds and to measure the degree of treatment success.
- Employ the minimum tool approach and an adaptive strategy using the site-specific implementation process.

Weed management goals proposed for the North Fork and Salmon-Cobalt Ranger Districts:

- Eradicate all new starts (less than 5 acres in size) of aggressive weeds.
- Reduce established infestations of aggressive weeds 5 to 25 acres in size by 25-50 percent.
- Contain established infestations of aggressive weeds greater than 25 acres in size.
- Eradicate all new starts (less than 5 acres in size) of less aggressive weeds.
- Reduce infestations of less aggressive weeds greater than 5 acres in size by 50 percent.
- Implement site restoration and revegetation actions (where appropriate) and monitoring programs following treatment to reduce or eliminate the subsequent reinvasion of weeds and to measure the degree of treatment success.
- Employ the minimum tool approach and an adaptive strategy using the site-specific implementation process.

The period of weed treatment for Alternative 1 would continue until a change in weed conditions on the S-CNF becomes evident, consistent with the proposed weed management goals. It is assumed that full funding would be available for implementing Alternative 1 to work toward achieving those goals.

TABLE 2-5

Estimated Acres and Number of Sites of Inventoried Weed Infestations and Possible Treatment Options Considered to be Potentially the Most Successful and Efficient Means for Treating Weeds on the S-CNF^{1,2}

		Possible Treatment Options						
		Mechanical	Biological	Chemical	Mechanical and Biological	Mechanical and Chemical	Biological and Chemical	Grazing and Chemical
TOTAL								
Acres		1,288	29,999	30,229	336	172	4,278	235
Sites		385	159	1,484	9	69	366	252

¹Excludes the Frank Church River of No Return Wilderness.

²Acres based on values contained in Appendix B and rounded to the nearest acre and on information contained in Appendices C and J.

d. Alternative 2—Mechanical, Biological, Controlled Grazing, and Combinations of Treatments (No Herbicide Application)

The objective of Alternative 2 is to increase the level of noxious weed management throughout the S-CNF compared to current conditions using mechanical, biological, controlled grazing, and combinations of these treatments. Except for the exclusion of herbicides, all other treatment components and processes described for the Proposed Action and Alternative 1 would be implemented under Alternative 2. These include a full array of treatment (*Section 2.C.1*) and non-treatment (*Section 1.A.1* and *Section 2.D.1.a*) practices, site restoration and revegetation (where appropriate) and monitoring programs (*Section 2.C.3*), implementing all mitigating BMPs and SOPs except those associated with herbicides (*Section 2.D.3* and Appendix A), employing a site-specific minimum tool approach (*Section 2.C.5*) and site-specific implementation process (*Section 2.C.6*), and following an adaptive strategy (*Section 2.C.4*) in managing future weed infestations.

Herbicides would not be applied under Alternative 2, and they would not be authorized for future use in the adaptive weed management strategy under this alternative. This would limit the choice and in most cases the effectiveness of treatments available for various species and sizes of noxious weed infestations. It would also limit the flexibility to select from a wide range of treatment methods if initial treatments are unsuccessful and re-treatments with a different method are necessary.

Table 2-6 lists the acres of weed infestations on the S-CNF Ranger District that would potentially be treated annually using the various available treatment options under Alternative 2. The expected time frames and goals for accomplishing the management objective would vary depending on the extent and severity of weed infestation—the same as noted for the Proposed Action and Alternative 1. However, it is anticipated that because of fewer treatment methods available for use under Alternative 2 it is not likely that the same level of success would be achieved as for the Proposed Action and Alternative 1. This is especially true for the North Fork and Salmon/Cobalt Ranger Districts where weed infestations are considerably greater than on the other five S-CNF Ranger Districts. In many cases where a reduction in the size of infestation is possible under other alternatives, only controlling or containing the infestation is realistic under Alternative 2, without the use of herbicides. Because of these differences and reduced management expectations, the following separate sets of management goals are proposed for the S-CNF Ranger Districts under Alternative 2:

Weed management goals proposed for the Challis, Leadore, Lost River, Middle Fork, and Yankee Fork Ranger Districts

- Eradicate all new starts (less than 5 acres in size) of aggressive weeds.
- Reduce established infestations of aggressive weeds 5 to 25 acres in size by 25 percent.
- Contain established infestations of aggressive weeds greater than 25 acres in size.
- Eradicate all new starts (less than 5 acres in size) of less aggressive weeds.
- Control infestations of less aggressive weeds greater than 5 acres in size.

- Implement site restoration and revegetation actions (where appropriate) and monitoring programs following treatment to reduce or eliminate the subsequent reinvasion of weeds and to measure the degree of treatment success.
- Employ the minimum tool approach and an adaptive strategy using the site-specific implementation process.

Weed management goals proposed for the North Fork and Salmon-Cobalt Ranger Districts

- Eradicate all new starts (less than 5 acres in size) of aggressive weeds.
- Contain established infestations of aggressive weeds 5 to 25 acres in size.
- Contain established infestations of aggressive weeds greater than 25 acres in size.
- Eradicate all new starts (less than 5 acres in size) of less aggressive weeds.
- Contain infestations of less aggressive weeds greater than 5 acres in size.
- Implement site restoration and revegetation actions (where appropriate) and monitoring programs following treatment to reduce or eliminate the subsequent reinvasion of weeds and to measure the degree of treatment success.
- Employ the minimum tool approach and an adaptive strategy using the site-specific implementation process.

The period of weed treatment for Alternative 2 would continue until a change in weed conditions on the S-CNF becomes evident, consistent with the proposed weed management goals. It is assumed that full funding would be available to work toward achieving those goals.

TABLE 2-6

Estimated Acres of Weed Infestations to be Treated Annually and Possible Treatment Options on the S-CNF for the No Action Alternative, Proposed Action, Alternative 1, and Alternative 2^{1,2,3}

	Possible Treatment Options									Total Acres
	Mechanical	Biological	Chemical	Mechanical and Chemical	Biological and Chemical	Grazing and Chemical	Mechanical and Biological	Mechanical and Grazing	Biological and Grazing	
No Action Alternative	50	550	2,350	50	500	0	0	0	0	3,500
Proposed Action	100	2,600	13,600	100	1,200	100	100	100	100	18,000
Alternative 1	100	2,600	7,000	200	7,600	200	100	100	100	18,000
Alternative 2	2,000	8,000	0	0	0	0	6,000	500	1,500	18,000

¹Excludes the Frank Church River of No Return Wilderness.

²Estimated treatment acres based on values contained in Appendix B and information contained in Appendices C and J.

³Estimated treatment acres for the No Action Alternative reflect current and anticipated trends.

2.D.3. Management Practices and Mitigation Measures

BMPs for weed prevention and management that are followed by Region 4 of the Forest Service would continue under the Proposed Action, Alternatives 1 and 2, and the No Action Alternative and are listed in Appendix A. In addition, mitigation measures, BMPs, and SOPs (management practices) specifically associated with all weed treatments, with the ground-based application of herbicides, and with the aerial application of herbicides would be implemented as integral parts of each alternative depending on types of treatments being proposed. Buffer zones are an important part of these mitigation tools during herbicide use, and were developed based on chemical characteristics and designed to minimize the risk of chemical drift or surface movement to non-target species and sensitive resources. These mitigation measures, BMPs, and SOPs are listed in the following text and are intended to avoid, minimize, or offset the potential for adverse impacts on S-CNF resources.

a. Management Practices and Mitigation Measures Common to All Alternatives

1. All invasive weed treatment activities will comply with State and Federal laws and agency manuals, handbooks, and guidelines.
2. Ground disturbances resulting from weed treatment activities will be revegetated with an appropriate, certified noxious-weed-free seed mix or root stock and fertilized, as necessary.
3. Revegetation will be required for any site within the treatment area with substantial soil disturbance or where the native vegetative density is determined to be inadequate for successful site restoration.
4. Native species will be included in revegetation seed mixes. Use of non-native plant materials on National Forest System lands will be considered as necessary to meet site recovery objectives.
5. A full spectrum of plant species including grasses, forbs, and shrubs (as appropriate) will be used on revegetation sites in order to have the greatest potential to hold the site against weed reinfestation and meet site recovery objectives.
6. Clean all equipment before leaving the project site when operating in areas infested with weeds. Equipment coming from outside the S-CNF must be cleaned prior to entering the S-CNF. Vehicles may be inspected to ensure equipment is cleaned.
7. Provisions will be specified (in the permit and/or operating plan) as needed for the prevention and control of weeds when new and existing use permits are issued/reissued.
8. All weeds that are mechanically or hand excavated after bud stage will be bagged and properly disposed.
9. New biological agents will not be released until approved by the USDA APHIS.
10. A site-specific project operation plan will be required prior to initiating a controlled livestock grazing treatment. (Does not apply to the No Action Alternative.)

11. Prehistoric trails, remnants of historic structures, and other heritage resources will be protected from disturbance during treatment activities.
12. A 1/2 mile radius no disturbance zone will be implemented from March through August around known great gray owl, northern goshawk, Cooper's Hawk, sharp-shinned hawk, and bald eagle nesting sites; a 1/8 mile no disturbance zone will be implemented around all other raptor nests.
13. Tribal notification to the resource technical staff of dates, locations, maps, and a summary of potential impacts and hazards will be provided to the Tribes so that appropriate notification to Tribal members can be made.
14. When scheduling treatment activities, consider the seasonal harvesting periods of wildlife, fish, and plants to accommodate the needs of the Tribes.

b. Management Practices and Mitigation Measures Common to the Proposed Action, Alternative 1, and the No Action Alternative

1. All chemicals will be applied in accordance with EPA registration label requirements and restrictions.
2. Herbicide applicators will obtain a weather forecast for the area prior to initiating a spraying project to ensure no extreme precipitation or wind events could occur during or immediately after spraying that could allow runoff or drift into streams.
3. A Pesticide Application Record (PAR) will be completed on a daily basis for each project area detailing the chemical application, treatment area, target species distribution and density, weather conditions, and recommendations for follow-up treatments or rehabilitation.
4. Treatment areas will be identified on maps available at the Ranger District offices and the Public Lands Office in Salmon, Idaho. The herbicides used, dates of use, and name and phone number to contact for more information will also be available.
5. Application of any herbicides to treat noxious weeds will be performed by or directly supervised by a State or Federal licensed applicator.
6. Procedures for mixing, loading, and disposal of herbicides as outlined in Appendix D will be followed.
7. Herbicide applications will be coordinated with permit holders within the project areas, as appropriate.
8. Chemical herbicides will not be applied to open water, unless the label specifically allows such applications.
9. No chemical herbicides will be used within a 100-foot radius of any potable water spring development.
10. Specific label directions, recommendations, and guidelines will be followed to reduce drift potential (i.e., nozzle size and pressure, additives, wind speed).

11. No spraying of any herbicide will occur when wind velocity exceeds 10 mph, as per State of Idaho Department of Agriculture standards.
12. No spraying of any herbicide will occur within 50 feet of open water when wind velocity exceeds 5 mph.
13. A 50-foot no-spray buffer zone will apply for broadcast or 'block' applications and a 15-foot buffer will apply for spot applications along all flowing water streams and ponded water bodies. Reduced buffer zones will be considered when using label-approved aquatic formulations (e.g., aquatic 2,4-D).
14. A 50-foot no-spray buffer zone will apply to all perennial and intermittent streams and areas with water tables less than 6 feet deep when applying picloram (Tordon 22K).
15. No spraying of picloram will occur within 100 feet of surface water when wind velocity exceeds 5 mph.
16. No more than one application of picloram in a treatment area will occur per year.
17. Vehicle-mounted boom sprayers will travel in an upstream direction to dilute over sprays, providing traffic safety is not jeopardized.
18. Dyes (e.g., Insight, Hilite) will be used in riparian areas, and other locations as appropriate, to provide visual evidence of treated vegetation.
19. All herbicides will be handled following Forest Service Handbook (FSH) 6709 and 2109, and Forest Service Manual (FSM) 2150 guidelines.
20. Herbicides applicators will be familiar with and carry a Herbicide Emergency Spill Plan (Appendix D) to reduce the risk and potential severity of an accidental spill. The plan will identify methods to report and clean up spills should they occur. Herbicide applicators will also carry spill-containment equipment.
21. All treatment sites will be evaluated for sensitive plant habitat suitability. If suitable habitat is present and a field survey has not previously been performed, a properly timed field survey will be performed prior to treatment.
22. No chemical will be applied directly on sensitive plants during spot applications and a 100-foot buffer will be employed around known populations of sensitive plants during broadcast (block) applications.
23. Weed-specific herbicides will be used on big game winter range to minimize impacts to winter forage.

c. Management Practices and Mitigation Measures Specific to Aerial Herbicide Application for the Proposed Action

1. All aviation activities will be in accordance with FSM 5700 (Aviation Management), FSM 2150 (Pesticide Use Management and Coordination), FSH 5709.16 (Flight Operations Handbook), FSH 2109.14, 50 (Quality Control Monitoring and Post-Treatment Evaluation), and the Salmon-Challis National Forest Aviation Plan. A Project Aviation Safety Plan will be developed prior to aerial spray applications.

2. A checklist will be developed and signed-off to ensure that all treatment practices, mitigation measures, and safety measures are in place before aerial treatment of any project area.
3. Herbicide applicators will obtain a weather forecast for the area prior to initiating an aerial spraying project to ensure no extreme precipitation or wind events could occur during or immediately after spraying that could allow runoff or drift into streams.
4. Aerial herbicide application will not occur during periods of inversion.
5. The agency will coordinate with Idaho Department of Fish and Game (IDFG) when planning aerial spraying of big game winter ranges.
6. Mitigation measures such as timing, type of chemical, mixture, rates, etc., will be used to minimize impacts to winter big game forage from aerial spraying.
7. No aerial spraying will occur within 300 feet of developed campgrounds or residences.
8. Adjacent campgrounds within the project area will be closed during the application period.
9. Adjacent landowners and affected permit holders will be notified in advance of aerial herbicide applications.
10. Contact with potentially affected Indian Tribes will be made to inform them of aerial treatment locations and times.
11. All aerial treatment areas will be assessed or field surveyed for sensitive plants prior to initial spraying. If suitable habitat is present and a field survey has not previously been performed, a properly timed field survey will be performed prior to treatment.
12. Specific label directions, recommendations, and guidelines (i.e., nozzle size and pressure, additives, air speed, aircraft height, boom length, etc.) will be followed to reduce drift potential from aerial herbicide applications.
13. A 300-foot no-treatment buffer zone will be applied to sensitive plant populations.
14. Aircraft smokers, smoke bombs, or other onsite wind monitoring devices will be utilized to determine wind direction and speed.
15. Herbicide application will occur when winds are 6 mph or less and blowing away from sensitive resources.
16. Spray detection cards in buffer zones near sensitive resources (streams, campgrounds) may be utilized to monitor drift.
17. Buffer zones and treatment areas will be delineated (flagged and mapped) and reviewed with the pilot prior to aerial herbicide application.
18. A year-long 1/4-mile-radius “no-fly” zone will be designated to avoid disturbance to active bald eagle and peregrine falcon foraging and nesting sites.
19. A Forest Service Resource Advisor or Contract Officer Representative will be present onsite during aerial herbicide application activities.

20. A 300-foot no-treatment buffer zone will be used on all fish-bearing streams, lakes, and ponds.
21. A 100-foot no-treatment buffer zone will be used on all non-fish-bearing perennial and intermittent streams, lakes, and ponds.
22. No aerial herbicide applications will be allowed within watersheds that supply a municipal water source.

2.E. Alternatives Considered but Eliminated from Detailed Analysis

Several alternatives and components of alternatives for the proposed project were considered but eliminated from detailed analysis. Reasons for their dismissal included not meeting project purposes and needs; not meeting CEQ (NEPA) guidelines of being reasonable, feasible, and viable; not differing substantially from other alternatives being analyzed in detail; being beyond the scope of this EIS; and/or not complying with current laws, regulations, policies, and Forest Plan direction. Alternatives and components of alternatives not analyzed in detail are described in the following text.

The Proactive Prevention Alternative was identified by some publics during public scoping for consideration as an alternative to be analyzed in the Draft EIS. The intent of this alternative is to address and take action on human activities that promote the spread of weeds, specifically, close roads, modify authorized livestock grazing permits, and alter existing timber, mining, and recreational OHV activities. It should be noted, however, that a similar number of responders were opposed to any actions that would limit or curtail existing human uses or activities currently authorized on the Forest.

The purpose of the proposed project is to eradicate, contain, and control the spread and establishment of noxious and invasive non-native weed species. The strategy to accomplish this purpose incorporates IWM concepts utilizing both treatment and non-treatment mechanisms. The impacts to the natural and human environment of the various weed treatment options described in the alternatives are fully analyzed in Chapter 4. Weed prevention is an integral component of the IWM program and is adequately incorporated in the Proposed Action and in each of the alternatives described in *Section 2.D, Alternatives Analyzed in Detail*, of this chapter.

The human uses and activities addressed in this alternative are authorized through the Salmon NF and Challis NF Land and Resource Management Plans. Modification of these authorized uses through an Environmental Impact Statement Record of Decision would amend the two Forest Plans but would necessitate additional public scoping and further NEPA analysis beyond the original intent and scope of weed treatment activities. Addressing human use allocations, analyzing their impacts, and taking action on the numerous human activities that may contribute to the spread of noxious and invasive non-native weed species is more appropriate during Forest Plan Revision where use allocations are specifically identified, scoped, analyzed, assessed, and permitted. Since the original intent and scope of this EIS focused on assessing the impacts of weed treatments and not on

assessing impacts of allocating, authorizing, or permitting human uses across the Forest, the Proactive Prevention Alternative will not be considered further.

The No Treatment Alternative (Discontinue Current Weed Management Program) was Alternative F of the six preliminary alternatives presented at public scoping meetings. This “no management” alternative was considered but eliminated from detailed analysis because it does not meet any of the project purposes and needs, does not comply with the Forest Service’s IWM program, is inconsistent with Forest Service policy and plans mandating that noxious weeds and their adverse effects be managed on National Forests, and violates federal and state laws and executive orders. It also would be irresponsible of the Forest Service to ignore weeds on the S-CNF when their presence may impact weed control on adjacent private and public lands.

Another of the six preliminary alternatives also was eliminated from detailed analysis. This alternative was presented to the public during scoping as “Alternative E – Mechanical, Vegetative, Controlled Grazing, Biological, and Combinations of Treatments Followed by Herbicide Application if These Treatments are Unsuccessful.” This alternative was eliminated for two primary reasons. First, there was concern that if the non-herbicidal treatments fail and some time passes before this failure is determined, the subsequent weed infestation may have expanded substantially beyond the original acreage, thus further impacting forest resources. The need for increased follow-up herbicide treatments would then have greater potential impacts than the original action. Such an occurrence would not be consistent with meeting project purposes and needs. Second, incorporation of the “minimum tool” approach into the alternatives analyzed in detail should relieve concerns expressed by some of the public of applying chemicals or more chemicals than necessary to achieve treatment objectives. The minimum tool approach means, where practical, using the minimum weed treatment method or methods to accomplish management objectives associated with different weed treatment priorities.

Prescribed burns were considered for possible use as a mechanical treatment technique, but they were not analyzed in detail. It was determined that the potential use and effects of prescribed burns would be too difficult to analyze at a site-specific level and were beyond the scope of this EIS. Using prescribed burns would require further planning development (preparation of a burn plan) and NEPA compliance on the potential effects before this tool could be used on the S-CNF.

2.F. Comparison of Alternatives

Table 2-7 compares and contrasts important features, properties, benefits, and costs of the No Action Alternative, Proposed Action, and Alternatives 1 and 2. Table 2-7 provides summary information for each of these four alternatives on noxious weed management goals, degree to which the eight components of project purpose and need would be met, and components of the IWM Program that would be implemented, including treatment practices, site restoration and monitoring, adaptive strategy, minimum tool approach, and site-specific implementation process. Table 2-7 concludes with a summary of annual total treatment cost, annual average cost per acre treated, and cost versus benefit for each alternative. Table 2-8 provides supporting information and assumptions used to estimate annual costs for each of the treatment options associated with the four alternatives. Table 4-8

in Chapter 4 provides additional comparisons among the four alternatives based on their benefits to, and impacts on, biological, physical, human and socioeconomic, and cultural resources on the S-CNF.

As discussed in *Section 2.D.2, Description of Alternatives Analyzed in Detail* and summarized in Table 2-7, noxious weed management goals are most aggressive and expectations highest for the Proposed Action, intermediate for Alternative 1, and least aggressive and expectations lowest for the No Action Alternative and Alternative 2. This range reflects the full array of treatment practices that would be implemented annually on 18,000 acres of the S-CNF under the Proposed Action compared to fewer treatment methods (either no herbicide or no aerial herbicide application) under each of the other alternatives, as well as fewer acres treated annually under the No Action Alternative (3,500 acres). In addition, management goals are the same for all S-CNF Ranger Districts under the Proposed Action because of the flexibility to aggressively treat weed infestations regardless of species and density, size of infestation, and location (slope, access, and proximity to private land). For Alternatives 1 and 2, weed management goals (and the degree of aggressiveness) for the North Fork and Salmon/Cobalt Ranger Districts are separated from goals for the Challis, Leadore, Lost River, Middle Fork, and Yankee Fork Ranger Districts because of reduced management flexibility resulting from fewer weed treatment options and the presence of large and continuous blocks of weeds on the North Fork and Salmon/Cobalt Ranger Districts.

Table 2-7 lists the eight components of project purpose and need (described in *Section 1.C.3, Project Purpose* and *Section 1.C.4, Project Need*) and the degree to which they would be met by each of the four alternatives. The Proposed Action would be most effective in meeting overall project purpose and need, Alternative 1 would be intermediate in effectiveness, and the No Action Alternative and Alternative 2 would be least effective in meeting overall project purpose and need. (This conclusion is consistent with the discussion of the effectiveness of alternatives in *Section 4.F, Comparison of Alternatives* and comparisons of benefits to, and impacts on, environmental resources presented in Table 4-8 in Chapter 4). The Proposed Action meets all eight components of project purpose and need (Table 2-7). Alternative 1 also meets all eight components, but it meets five of them less effectively than the Proposed Action and only minimally meets one component of project purpose and need. Both Alternative 2 and the No Action Alternative are less effective in meeting all eight components of project purpose and need than either the Proposed Action or Alternative 1, either only minimally meeting or not meeting purpose and need components (Table 2-7).

As noted in the previous discussion of weed management goals, treatment practices implemented through the IWM Program would be most aggressive under the Proposed Action, intermediate under Alternative 1, and least aggressive under the No Action Alternative and Alternative 2 (Table 2-7). Other IWM components, including site restoration and monitoring, adaptive strategy, minimum tool approach, and site-specific implementation process, would be implemented with equal rigor under the Proposed Action, Alternative 1, and Alternative 2. These same IWM components would either be limited in scope or not implemented under the No Action Alternative (Table 2-7).

TABLE 2-7

Comparison of Features, Properties, Costs, and Benefits of the No Action Alternative, Proposed Action, Alternative 1, and Alternative 2

Items of Comparison	No Action Alternative	Proposed Action	Alternative 1	Alternative 2
Management Goals See Section 2.D.2.	<ul style="list-style-type: none"> • Maintain noxious weed prevention, education, and public awareness programs • Treat about 3,000 to 3,500 acres annually • Eradicate new invaders using approved herbicides and other treatment methods • Control and reduce spread of established weed infestations • Coordinate with counties and state agencies to determine priorities and develop uniform treatment strategies 	<p>The management objective is to maximize treatment of noxious weeds throughout the S-CNF as quickly as reasonably possible through a full array of treatment and non-treatment practices. The Proposed Action would treat about 18,000 acres of weeds each year and employ the following management goals:</p> <p>For all S-CNF Ranger Districts:</p> <ul style="list-style-type: none"> • Eradicate all new starts (<5 acres in size) of aggressive weeds • Reduce established infestations of aggressive weeds 5 to 25 acres in size by 75 to 100% • Reduce established infestations of aggressive weeds >25 acres in size by 50% • Eradicate all new starts (<5 acres in size) of less aggressive weeds • Reduce infestations of less aggressive weeds >5 acres in size by 50% • Implement site restoration and revegetation actions (where appropriate) and monitoring programs following treatment to reduce or eliminate the subsequent reinvasion of weeds and to measure degree of treatment success • Employ minimum tool approach and adaptive strategy using site-specific implementation process 	<p>Essentially the same as the Proposed Action, except this alternative does not include the aerial application of herbicides and is, therefore, less aggressive. About 18,000 acres of weeds would be treated each year. Different, lowered expectations for this alternative require different goals, depending on the conditions in the Ranger Districts:</p> <p>For Challis, Leadore, Lost River, Middle Fork, and Yankee Fork Ranger Districts:</p> <ul style="list-style-type: none"> • Eradicate all new starts (<5 acres in size) of aggressive weeds • Reduce established infestations of aggressive weeds 5 to 25 acres in size by 25 to 50% • Reduce established infestations of aggressive weeds >25 acres in size by 25% • Eradicate all new starts (<5 acres in size) of less aggressive weeds • Reduce infestations of less aggressive weeds >5 acres in size by 50% • Implement site restoration and revegetation actions (where appropriate) and monitoring programs following treatment to reduce or eliminate the subsequent reinvasion of weeds and to measure degree of treatment success • Employ minimum tool approach and adaptive strategy using site-specific implementation process 	<p>This alternative limits the kind of treatment methods available (no herbicides), and the success of these methods would be limited. About 18,000 acres of weeds would be treated each year. Different, lowered expectations for this alternative require different goals, depending on the conditions in the Ranger Districts:</p> <p>For Challis, Leadore, Lost River, Middle Fork, and Yankee Fork Ranger Districts:</p> <ul style="list-style-type: none"> • Eradicate all new starts (<5 acres in size) of aggressive weeds • Reduce established infestations of aggressive weeds 5 to 25 acres in size by 25 to 50% • Contain established infestations of aggressive weeds >25 acres • Eradicate all new starts (<5 acres in size) of less aggressive weeds • Control infestations of less aggressive weeds >5 acres in size • Implement site restoration and revegetation actions (where appropriate) and monitoring programs following treatment to reduce or eliminate the subsequent reinvasion of weeds and to measure degree of treatment success • Employ minimum tool approach and adaptive strategy using site-specific implementation process

TABLE 2-7

Comparison of Features, Properties, Costs, and Benefits of the No Action Alternative, Proposed Action, Alternative 1, and Alternative 2

Items of Comparison	No Action Alternative	Proposed Action	Alternative 1	Alternative 2
<p>Purpose and Need See Section 1.C. 1. Protect the natural condition and biodiversity of ecosystems and watershed function within the S-CNF by preventing and/or limiting introduction/spread of invasive non-native plant species.</p>	<p>Does not meet purpose and need. Would continue current noxious weed program. This alternative does not have the flexibility of the Proposed Action. The proportion of acreage treated with a particular chemical or method would vary from year to year, but would generally be limited to about 3,500 acres. Weeds in untreated areas would continue to spread.</p>	<p>Meets purpose and need. Uses full array of treatment and non-treatment methods to maximize the treatment of weeds as quickly as reasonably possible. Use of adaptive strategy, the minimum tool approach, and site-by-site implementation process would manage current and future weed populations. With aerial application and other cost-efficient methods available, the cost of treatment can be effectively spread throughout the S-CNF, based on the priorities identified.</p>	<p>For the North Fork and Salmon-Cobalt Ranger Districts:</p> <ul style="list-style-type: none"> • Eradicate all new starts (<5 acres in size) of aggressive weeds • Reduce established infestations of aggressive weeds 5 to 25 acres in size by 25 to 50% • Contain established infestations of aggressive weeds >25 acres in size • Eradicate all new starts (<5 acres in size) of less aggressive weeds • Reduce infestations of less aggressive weeds >5 acres in size by 50% • Implement site restoration and revegetation actions (where appropriate) and monitoring programs following treatment to reduce or eliminate the subsequent reinvasion of weeds and to measure degree of treatment success • Employ minimum tool approach and adaptive strategy using site-specific implementation process 	<p>For the North Fork and Salmon-Cobalt Ranger Districts:</p> <ul style="list-style-type: none"> • Eradicate all new starts (<5 acres in size) of aggressive weeds • Contain established infestations of aggressive weeds 5 to 25 acres • Contain established infestations of aggressive weeds >25 acres • Contain all new starts (<5 acres in size) of less aggressive weeds • Contain infestations of less aggressive weeds >5 acres in size • Implement site restoration and revegetation actions (where appropriate) and monitoring programs following treatment to reduce or eliminate the subsequent reinvasion of weeds and to measure degree of treatment success • Employ minimum tool approach and adaptive strategy using site-specific implementation process
			<p>Meets purpose and need, but less effectively than the Proposed Action. In the largest infested areas (typically steep and rocky), the most cost-effective mechanical and ground-spraying methods would not be available or limited. However, the need would be somewhat met through more expensive ground applications such as backpack and ATV applications where access and terrain are favorable. In the long term, the purpose and need would not be met or only very minimally met. Inaccessible large infestations could not be effectively treated due to limited mechanical treatment options and ground-based chemical applications.</p>	<p>Does not meet purpose and need. This alternative would not use herbicides; most mechanical methods would be ineffective on the larger infestations occupying the steep and rocky terrain of the North Fork and Salmon-Cobalt Ranger Districts. Choice of treatment methods would be severely limited and in most cases the effectiveness of the treatment would be questionable. Flexibility of treatment would be limited. In the long term, weeds would continue to spread.</p>

TABLE 2-7

Comparison of Features, Properties, Costs, and Benefits of the No Action Alternative, Proposed Action, Alternative 1, and Alternative 2

Items of Comparison	No Action Alternative	Proposed Action	Alternative 1	Alternative 2
2. Eliminate new weed invaders before they become established.	Minimally meets purpose and need. Does not include adaptive weed management strategy or the full array of treatment options. S-CNF personnel would be limited in the timeliness and scope of response to new infestations. This is the top treatment priority. In order to meet this purpose and need, resources would be reallocated from other treatment priorities/projects.	Meets purpose and need. Includes full array of treatment and non-treatment methods; allows swift response and follow-up monitoring if new weed invaders become established.	Minimally meets purpose and need. However, without aerial spraying, the largest weed infestations may only be contained or reduced by 25%. This is the top treatment priority. In order to meet this purpose and need, resources would be reallocated from other treatment priorities/projects.	Minimally meets the purpose and need, since eradication of new invaders is the primary goal for all treatment methods. However, the limited availability of alternative treatments and the expected time frame for effective success could result in only control or containment of the new infestation, not eradication.
3. Contain and reduce known and potential weed seed sources throughout the S-CNF.	Does not meet purpose and need. The current level (acres) of treatment is considerably less than known weed infestations, thus having little overall impact on weed seed sources.	Meets purpose and need. Known weed infestations would be eradicated, controlled, or contained.	Meets purpose and need, but not as effectively as the Proposed Action. Most known and potential weed sources would be reduced or contained.	Does not meet purpose and need, particularly if new and existing weed populations must be eradicated first. Given the cost of methods available under this alternative, the entire annual funding would likely be taken by eradication priorities.
4. Prevent or limit the spread of established weeds into areas containing little or no infestation.	Does not meet purpose and need. The No Action Alternative does not include a Forest-wide action plan to reduce or contain known weed sources. S-CNF personnel would be constrained from responding in a timely and cost-efficient manner to new weed infestations.	Meets purpose and need. Currently weed-free areas would be maintained in that condition through monitoring, adaptive strategy, site-specific implementation, and minimum tool approaches.	Meets purpose and need, but not as effectively as the Proposed Action. Most known weed infestations would be monitored, and any spread could be eradicated by use of the available treatment and non-treatment practices.	Does not meet purpose and need. This alternative focuses on containing established infestations. However, in the long term, the available treatment options would be unable to contain weed infestations as the "contained" infestations would continue to grow.
5. Protect sensitive and unique habitats from new and existing weed infestations.	Does not meet purpose and need. The No Action Alternative does not prevent new or existing weed populations from spreading.	Meets purpose and need. This alternative uses non-treatment and a full array of treatment options to aggressively prevent the spread of new and existing weed populations.	Would meet purpose and need where terrain allows effective treatment options. In areas of steep and rocky terrain (also the areas with the largest infestations of aggressive weeds), this purpose and need would not be met in the long term. Weed invasion from inaccessible areas would prevail and probably spread into more sensitive areas.	Does not meet purpose and need. Aggressive noxious weeds would spread throughout sensitive areas that are already at high risk for infestation.

TABLE 2-7

Comparison of Features, Properties, Costs, and Benefits of the No Action Alternative, Proposed Action, Alternative 1, and Alternative 2

Items of Comparison	No Action Alternative	Proposed Action	Alternative 1	Alternative 2
6. Develop criteria to prioritize invasive weed species and treatment areas.	Does not meet purpose and need. Prioritizes treatment methods and acres treated according to species of weed, its aggressiveness, whether it is new or established, and the location and size of the infestation. However, a full range of options to implement priorities is not available.	Meets purpose and need. Identifies treatment based on species of weeds present, their degree of aggressiveness, and the sizes and numbers of infestations; corresponding treatment priorities and objectives; treatment methods available; and estimated annual acres for treatment (18,000).	Meets purpose and need, but not as effectively as the Proposed Action. The largest areas of infestations may be treated with less aggressive measures since the typically steep and rocky terrain cannot be treated effectively with the available options. Although species and treatment areas would be identified and prioritized, the infestation may go unchecked while available options are implemented.	Does not meet purpose and need. Although management goals and priorities have been assigned under this alternative, these goals have greatly reduced "control and reduce" goals while increasing "contain" goals. Thus, prioritization and effectiveness are substantially reduced. Costs of eradication (the first priority in all alternatives) would also limit the ability to meet other control priorities.
7. Comply with and implement current Federal and State law regarding the control of noxious and other invasive, non-native weed species.	Does not meet purpose and need. Under this alternative, weed populations would not be contained or eradicated as required by law.	Meets purpose and need.	Meets purpose and need.	Minimally meets purpose and need, but containment is the only realistic goal in many locations under this alternative.
8. Cooperate with county, state, and other Federal agencies, private landowners, and other organizations interested in managing invasive weeds.	Minimally meets purpose and need.	Meets purpose and need. Would provide the most comprehensive weed treatment and communication with non-U.S. Forest Service organizations.	Meets purpose and need using the same methods as the Proposed Action.	Minimally meets purpose and need. The obligations of the S-CNF in cooperative efforts of weed control would be greatly reduced under this alternative.
Treatment Practices See Section 2.C.1.	No action implies no change from current weed management practices. Generally limited by selection of chemicals and mechanical methods, and the realm of treatment and non-treatment methods is limited to existing strategies. Total acres to be treated annually: up to about 3,500.	Most aggressive application of full array of treatment and non-treatment methods, including aerial application of herbicide. Total acres to be treated annually: about 18,000.	Employs full array of treatment and non-treatment methods, except aerial application of herbicide. Total acres to be treated annually: about 18,000.	Employs full array of treatment and non-treatment methods, except herbicide application. Total acres to be treated annually: about 18,000.
Site Restoration and Monitoring See Section 2.C.3.	Limited in scope. Monitor program implementation and measure the effectiveness of treatments on target species.	Implement (where appropriate) site restoration, re-vegetation, and implementation and effectiveness monitoring following treatment to reduce or eliminate the subsequent reinvasion of weeds, measure the degree of treatment success, and validate buffering effectiveness.	Same as the Proposed Action.	Similar to the Proposed Action (excluding buffer validation monitoring).

TABLE 2-7

Comparison of Features, Properties, Costs, and Benefits of the No Action Alternative, Proposed Action, Alternative 1, and Alternative 2

Items of Comparison	No Action Alternative	Proposed Action	Alternative 1	Alternative 2
Adaptive Strategy See Section 2.C.4.	Not included. Constrains S-CNF managers from responding in a timely and cost-effective manner to new weed infestations and expansion of existing weed infestations.	Implements S-CNF-wide action plan to reduce or eliminate spread of weeds; adaptive weed management strategy for managing future new weed infestations or expansion of existing infestations.	Same as the Proposed Action	Same as the Proposed Action
Minimum Tool Approach and Site-Specific Implementation Process See Sections 2.C.5 and 2.C.6.	Not included	Employ site-specific minimum tool approach for effectively managing future weed infestations with the least impact on S-CNF resources, uses, and values.	Same as Proposed Action.	Same as Proposed Action.
Total Cost per Year See Table 2-8 for detail.	\$843,226	\$3,017,588	\$6,852,750	\$16,370,000
Cost Per Acre per Year See Table 2-8 for detail.	\$241	\$168	\$381	\$909
Cost vs. Benefit Cost per acre: Low: \$<200 Moderate: \$201-300 High: >\$300 See Table 2-8 for detailed supporting information and assumptions regarding costs per acre for different treatment methods for the Proposed Action and alternatives. Benefit is the overall effectiveness in light of the purpose and need compared to other alternatives:	Total annual cost is considered moderate, since treatment options are limited and the number of acres to be treated is much less than the other alternatives. Average cost per acre for all acres treated is moderate. See Table 2-8 for details on costs. Benefit is considered low. Overall weed treatment effectiveness of the No Action Alternative would be lower than for the Proposed Action or Alternative 1 because of fewer treatment options and fewer acres treated each year, but greater than for Alternative 2 because of more treatment options. See Table 4-8 for details on benefits.	Total annual cost is considered low, depending on treatment combinations and acres treated. Average cost per acre for all acres treated is low. See Table 2-8 for details on costs. Benefit is considered high. Provides the greatest number of weed treatment options and ability to reach large acreages and difficult access areas. Overall weed treatment effectiveness of the Proposed Action would be greater than for Alternatives 1 and 2 and the No Action Alternative because of a full range of treatment options and the number of acres to be treated each year. See Table 4-8 for details on benefits.	Total annual cost is considered high, depending on treatment combinations and acres treated. Average cost per acre for all acres treated is high. Weed treatment options limited by lack of aerial herbicide application. See Table 2-8 for details on costs. Benefit is considered moderate/high. Overall weed treatment effectiveness of Alternative 1 would be less than for the Proposed Action because of fewer treatment options, but greater than for Alternative 2 and the No Action Alternative because of more treatment options and/or more acres treated each year. See Table 4-8 for details on benefits.	Total annual cost is considered high. Average cost per acre for all acres treated is high. Weed treatment options are limited to mechanical, biological, and grazing methods. Grazing may not be an option for many areas, and some mechanical treatments may be limited in application. See Table 2-8 for details on costs. Benefit is considered low. Overall weed treatment effectiveness of Alternative 2 would be less than for the Proposed Action, Alternative 1, and the No Action Alternative because of fewer effective weed treatment options. See Table 4-8 for details on benefits.

TABLE 2-7

Comparison of Features, Properties, Costs, and Benefits of the No Action Alternative, Proposed Action, Alternative 1, and Alternative 2

Items of Comparison	No Action Alternative	Proposed Action	Alternative 1	Alternative 2
<p>Low: Does not meet purpose and need.</p> <p>Moderate: Meets purpose and need, but not effectively.</p> <p>High: Meets purpose and need effectively.</p> <p>See Table 4-8 for a summary of project-related effects and benefits for the Proposed Action and alternatives.</p>				
<p>Cost Effectiveness</p> <p>See Section 4.D.4</p>	Cost effectiveness is considered low to moderate because fewer acres would be treated under this alternative and weed treatment goals would not be met.	Cost effectiveness is considered high because treatment methods could be selected to most efficiently and effectively meet all weed treatment goals.	Cost effectiveness is considered low to moderate because of limited use of the most economic and effective treatment methods and not meeting all weed treatment goals.	Cost effectiveness is considered low because of the use of expensive weed treatment methods with limited effectiveness and not meeting weed treatment goals.

Tables 2-7 and 2-8 provide cost information and Table 2-7 compares cost versus benefit among the four alternatives. Estimated total annual weed treatment costs would be approximately \$843,000 for the No Action Alternative (3,500 acres treated annually). For the other three alternatives that would treat 18,000 acres annually, estimated total annual weed treatment costs would be approximately \$3,020,000 for the Proposed Action, \$6,850,000 for Alternative 1, and \$16,370,000 for Alternative 2. Estimated cost per acre treated per year would be lowest under the Proposed Action (\$168 per acre per year), intermediate under the No Action Alternative (\$241) and Alternative 1 (\$381), and highest under Alternative 2 (\$909 per acre per year). The comparatively low cost per acre treated for the Proposed Action reflects the predominance and relatively low cost of aerial herbicide application compared to other treatment methods proposed for use under this alternative (Table 2-8). Aerial herbicide application is not proposed for use under any of the other alternatives.

Cost/benefit comparisons among alternatives presented in Table 2-7 show that the Proposed Action would provide the greatest weed treatment benefits at the lowest treatment cost per acre. Conversely, Alternative 2 would provide the fewest weed treatment benefits at the highest treatment cost per acre. Alternative 1 would provide moderate to high weed treatment benefits and the second highest treatment cost per acre. The No Action Alternative would have the second lowest treatment cost per acre but only provide low weed treatment benefits (Table 2-7).

Cost comparison information in Table 2-8 reflects the range of individual treatment options and costs within and among the four alternatives, as well as the variation in estimated annual treatment costs per acre among and within some of the treatment options. Treatment costs per acre per year would be lowest for the aerial and ground-based application of herbicides under the Proposed Action (\$46.25 per acre per year), followed by grazing (\$60 per acre per year), and then the ground-based application of herbicides under Alternative 1 and the No Action Alternative (\$75.25 per acre per year). Treatment costs per acre per year would be highest for mechanical treatment (\$1,000 per acre per year) followed by biological treatment (\$500 per acre per year). Table 2-8 footnotes show the wide range in mechanical treatment costs per acre, depending on labor intensity (up to \$8,500 per acre for hand pulling weeds). For treatment combinations, estimated costs equal the combined cost of the individual treatments since both treatments would be implemented to increase efficiency and effectiveness.

As indicated in Table 2-8 footnotes, the predominance of aerial chemical treatment under the Proposed Action, together with the low cost per acre for this treatment, accounts for the much lower total annual treatment cost for the Proposed Action than Alternatives 1 or 2, and for the lowest overall treatment cost per acre among all alternatives. Conversely, the predominance of mechanical and biological treatments under Alternative 2, together with the high costs per acre for these treatments, accounts for the substantially higher total annual treatment cost for this alternative than the Proposed Action or Alternative 1, and for the highest overall treatment cost per acre among all alternatives.

2.G. Selection of the Preferred Alternative

The Forest Service has selected the Proposed Action as the Preferred Alternative based on the analyses presented in this Final EIS. Among the alternatives evaluated, the Proposed

Action best meets all of the project purposes and needs, contains the most aggressive and flexible treatment practices for achieving noxious weed management goals, and would provide the greatest weed treatment benefits at the lowest cost per acre. The Proposed Action would be the most effective of the alternatives evaluated in eradicating, controlling, and containing noxious weeds on the S-CNF and in benefiting a broad range of S-CNF resources.

2.H. Environmentally Preferred Alternative

The Forest Service has identified Alternative 2 as the Environmentally Preferred Alternative. This recognition is based on its lack of herbicide use and their potential impacts to the environment. However, Alternative 2 is also recognized as being the least effective of the alternatives evaluated in controlling noxious and non-native invasive weeds, thus having the greatest long-term impacts to native plants, wildlife habitat, and ecosystem health. While Alternative 2 is Environmentally Preferred in the short-term, the Proposed Action is expected to result in the greatest environmental benefits over the long-term and was therefore selected as the Preferred Alternative.

TABLE 2-8

Alternatives Annual Cost Comparison

Following are assumptions, calculations, and estimated costs per year of implementing noxious weed management for the various alternatives. Estimated costs do not reflect overhead or inflation. No attempt was made to estimate the costs of failure to control noxious weeds or aggressively quantify the beneficial effect of weed control on biodiversity or commercial activities associated with ecosystem health. Alternatives 1 and 2 assume that mechanical treatment options (except for very limited hand pulling) would not be appropriate for use in areas with rough, steep terrain. See Section 4.D.4 for a detailed discussion of socioeconomics.

	Possible Treatment Options									Total Acres Treated, Total Cost, and Average Cost per Acre per Year
	Mechanical	Biological	Chemical	Mechanical and Chemical	Biological and Chemical	Grazing and Chemical	Mechanical and Biological	Mechanical and Grazing	Biological and Grazing	
No Action Alternative	50	550	2,350	50	500	0	0	0	0	3,500
Number of acres treated per year										
Total cost treatment option per year	\$50,000	\$275,000	\$176,838	\$53,763	\$287,625	\$0	\$0	\$0	\$0	\$843,226
Cost per acre per year	\$1,000	\$500	\$75.25	\$1,075.25	\$575.25	NA	NA	NA	NA	\$241
Proposed Action	100	2,600	13,600	100	1,200	100	100	100	100	18,000
Number of acres treated per year										
Total cost treatment option per year	\$100,000	\$1,300,000	\$629,000	\$10,463	\$655,500	\$10,625	\$150,000	\$106,000	\$56,000	\$3,017,588
Cost per acre per year	\$1,000	\$500	\$46.25	\$1,046.25	\$546.25	\$106.25	\$1,500	\$1,060	\$560	\$168
Alternative 1	100	2,600	7,000	200	7,600	200	100	100	100	18,000
Number of acres treated per year										
Total cost treatment option per year	\$100,000	\$1,300,000	\$526,750	\$215,050	\$4,371,900	\$27,050	\$150,000	\$106,000	\$56,000	\$6,852,750
Cost per acre per year	\$1,000	\$500	\$75.25	\$1,075.25	\$575.25	\$135.25	\$1,500	\$1,060	\$560	\$381

TABLE 2-8

Alternatives Annual Cost Comparison

Following are assumptions, calculations, and estimated costs per year of implementing noxious weed management for the various alternatives. Estimated costs do not reflect overhead or inflation. No attempt was made to estimate the costs of failure to control noxious weeds or aggressively quantify the beneficial effect of weed control on biodiversity or commercial activities associated with ecosystem health. Alternatives 1 and 2 assume that mechanical treatment options (except for very limited hand pulling) would not be appropriate for use in areas with rough, steep terrain. See Section 4.D.4 for a detailed discussion of socioeconomics.

	Possible Treatment Options									Total Acres Treated, Total Cost, and Average Cost per Acre per Year
	Mechanical	Biological	Chemical	Mechanical and Chemical	Biological and Chemical	Grazing and Chemical	Mechanical and Biological	Mechanical and Grazing	Biological and Grazing	
Alternative 2	2,000	8,000	0	0	0	0	6,000	500	1,500	18,000
Number of acres treated per year										
Total cost treatment option per year	\$2,000,000	\$4,000,000	\$0	\$0	\$0	\$0	\$9,000,000	\$530,000	\$840,000	\$16,370,000
Cost per acre per year	\$1,000	\$500	NA	NA	NA	NA	\$1,500	\$1,060	\$560	\$909

Total Costs Derived – Average Treatment Cost per Acre

Mechanical Treatment: \$1,000.00. Mechanical weed treatment costs vary from approximately \$300 per acre for power mowing to \$8,500 per acre for hand pulling. For purposes of comparing treatment costs among alternatives, an average mechanical treatment cost of \$1,000 per acre is used.

Biological Treatment: \$500.00

Chemical Treatment: \$46.25 (Proposed Action). The proportion of acres treated chemically under the Proposed Action using different application methods, together with associated costs per acre, are based on the following assumptions: aerial (50 percent, \$25 per acre); truck (20 percent, \$30 per acre); backpack (15 percent, \$125 per acre); and ATV (15 percent, \$60 per acre).

Chemical Treatment: \$75.25 per acre without aerial spraying (No Action Alternative and Alternative 1). The proportion of acres treated chemically under Alternative 1 and the No Action Alternative using different application methods, together with associated costs per acre, are based on the following assumptions: truck (25 percent, \$30 per acre); backpack (35 percent, \$125 per acre); and ATV (40 percent, \$60 per acre).

Grazing: \$60

Combined Mechanical and Chemical Treatments: \$1,000 Mechanical + \$46.25 (\$75.25) Chemical = \$1,046.25 (Proposed Action); \$1,075.25 (No Action Alternative and Alternative 1)

Combined Biological and Chemical Treatments: \$500 Biological + \$46.25 (\$75.25) Chemical = \$546.25 (Proposed Action); \$575.25 (No Action Alternative and Alternative 1)

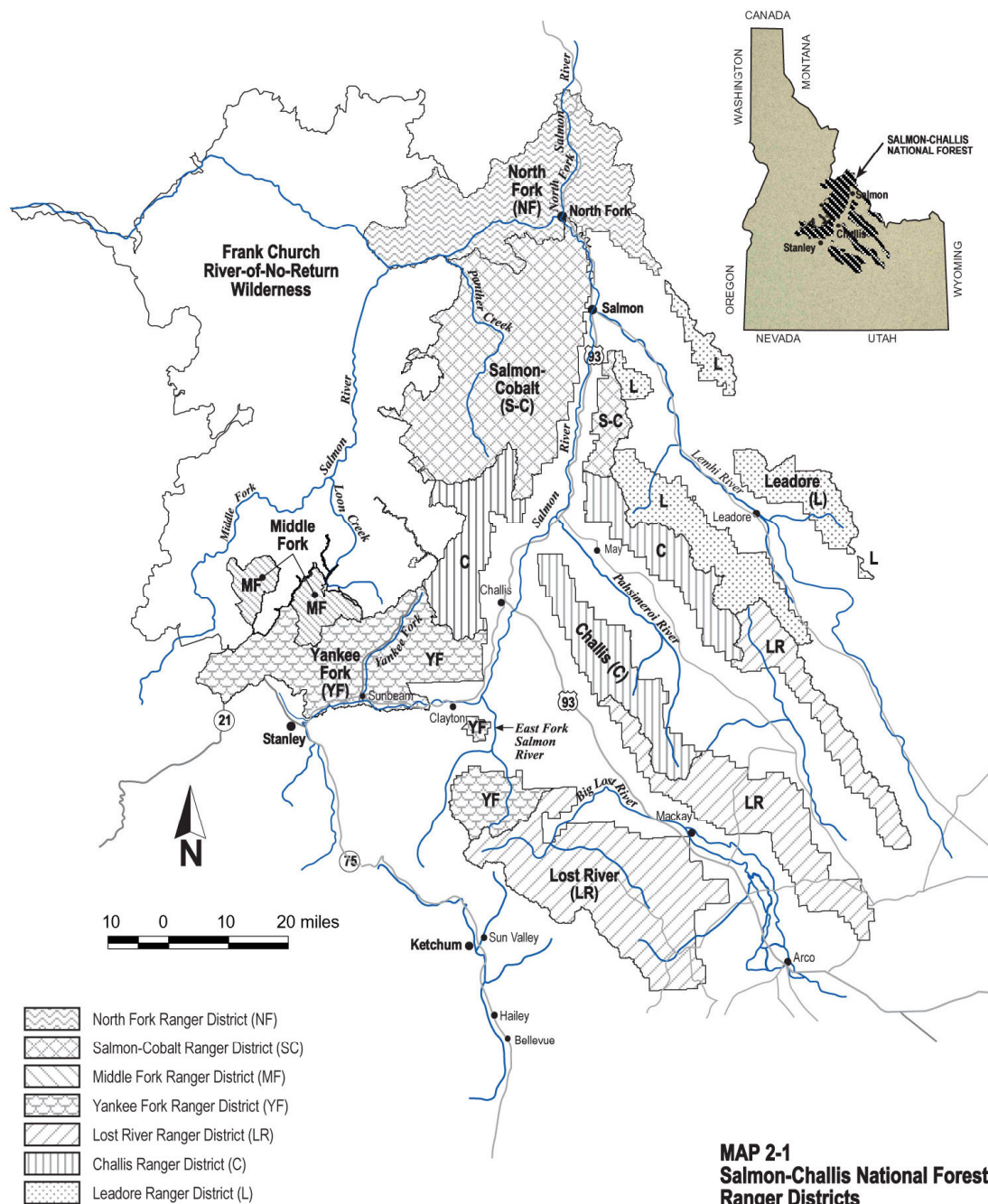
Combined Grazing and Chemical Treatments: \$60 Grazing + \$46.25 (\$75.25) Chemical = \$106.25 (Proposed Action); \$135.25 (Alternative 1)

Combined Mechanical and Biological Treatments: \$1,000 Mechanical + \$500 Biological = \$1,500.00

Combined Mechanical and Grazing Treatments: \$1000 Mechanical + \$60 Grazing = \$1,060.00

Combined Biological and Grazing Treatments: \$500 Biological + \$60 Grazing = \$560.00

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